NATIONAL
FRUIT AND CIDER INSTITUTE,
LONG ASHTON,
NEAR BRISTOL.

REPORT

FOR THE YEAR

1909.

BATH:
PRINTED BY WILLIAM LEWIS & SON, 12 NORTH GATE.

17.xii.15.

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Jones, George. Wood Farm, Welland, Malvern.
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McCreath. W. D. Quantock Vale Cider Works, North Petherton, Bridgwater.
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Pope, John M. Spence Combe, Copplestone, Devon.
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Reid, Hugh. Long Ashton, Bristol.
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Secretary, Devon Agricultural Education Committee.
,, Gloucester ,, ,, ,,
,, Hereford ,, ,, ,,
,, Somerset ,, ,, ,,
,, Worcester ,, ,, ,,
Lloyd, F. J. Muscovy House, Trinity Square, London, E.C.

Resident Director:

B. T. P. Barker, M.A. The National Fruit and Cider Institute, Long Ashton, Bristol.

Superintendent of Fruit Department:

J. Ettle, F.R.H.S. Stanley Grove Road, Weston-super-Mare.

Hon. Treasurer:

H. B. Napier. Estate Office, Long Ashton, Bristol.

Hon. Secretary:

W. J. Grant. County Council Offices, Pentonville, Newport. Mon.

REPORT BY THE GOVERNORS.

1. The Governors beg to submit to the Members the following Report on the work of the Institute during the past year.

2. The Institute has been founded and is maintained by the following Bodies :—

The Board of Agriculture and Fisheries.
The Bath and West and Southern Counties Society.
Devon County Council.
Gloucester County Council.
Hereford County Council.
Monmouth County Council.
Somerset County Council.
Worcester County Council.

Members and Associates.

3. Since the formation of the Institute, new Members and Associates have been enrolled each year, and the Governors hope that as the work and objects of the Institute become more widely known there will be a steady increase in the number of both Members and Associates.

4. In accordance with Article 30 of the Articles of Association, the following Governors retire :—

Governors.	By whom appointed.
Mr. H. J. Davies	Somerset County Council.
Mr. H. H. Gibbons	Members and Associates.
Mr. R. Neville Grenville	Board of Agriculture.
Mr. J. S. Smyth-Osbourne	Devon County Council.
Mr. John Riley	Governors.
Sir John Shelley, Bart.	Governors.
Mr. James Slatter	Worcester County Council.
Mr. J. W. Smith	Hereford County Council.
Mr. James Watts	Members and Associates.

These Governors are eligible for re-nomination by the various bodies whom they represent.

Advantages of Institute.

5. The Governors and Managing Committee wish to impress upon the Counties concerned, and upon all persons interested in the important industry of Cider-making the advantages of the opportunity now placed at their disposal,

through the formation of the Institute, by means of which they may obtain advice and assistance bearing upon this industry, either by personally visiting the Institute, or by sending their sons there to receive instruction, scientific and practical, not only in Cider and Perry-making, but also in the growth of fruit and the production of fruit trees.

Terms.

6. Students can be received on the following terms :—

Scientific instruction in the Laboratory :—

Four guineas for one month's instruction ; or

Ten guineas for three months' instruction.

Working pupils from subscribing Counties can be received at the Institute for a period of not less than one year for instruction upon Fruit-growing, and to work upon the Farm. Pupils to receive a wage of 7s. 6d. per week from the Institute, the Counties sending the pupils to contribute a Scholarship of £20 per annum.

Bristol University.

7. In addition to the advantages already mentioned, arrangements were made three years ago with the University College of Bristol for a conjoint course of instruction in Fruit-growing and Cider-making (including the study of Cider ferments) to which the interested bodies and counties are entitled to send one student free of charge for this special course.

Distribution of Cider Apple and Perry Pear Trees.

8. 2,160 trees have again been distributed during this season (1909) for the purpose of establishing, what might be termed, the best examples of Cider and Perry Orchards to the following :—

Devon County Council	.. ..
Gloucester County Council	.. ..
Hereford County Council	.. ..
Monmouth County Council	.. ..
Somerset County Council	.. ..
Worcester County Council	
Board of Agriculture	.. ..
Bath and West Society	.. ..
Members	.. ..

Practical Work.

9. In October and November, 1909, the Cider-making months, a large number of those interested in the West country industry of Cider-making availed themselves of the opportunity of visiting the Institute.

Inspection of Institute, Fruit Nursery and Plantation.

10. Since the last Report the Institute has been inspected by those who are interested both in the Cider industry and Fruit Culture from many counties, including representatives from the Agricultural and Horticultural Education Associations, all of whom seemed to be thoroughly impressed with the very practical and thorough manner in which the making of Cider was carried out, and also in the production of the best Cider Apples and Perry Pears, which are being grown in the Nursery attached to the Institute.

Object Lesson.

11. With a view of extending the usefulness of the Institute arrangements were made by which exhibits from an educational standpoint were sent to—

Bath and West and Southern Counties Society, Exeter.
Berkeley Hunt Agricultural Society's Show.
Royal Agricultural Society, Gloucester.
Brewers' Exhibition, London.
Devon County Show.
Hereford and Worcester Agricultural Society's Show.
Mid-Somerset Agricultural Society's Show.
Somerset County Agricultural Society's Show.
East Somerset Agricultural Society.
Taunton Deane Horticultural Society.
Gloucester Agricultural Society.
Backwell Apple Show.
Hereford County Council Exhibition.

Annual Tasting Day.

12. A thoroughly representative, and certainly one of the largest, gatherings that has yet taken place at the Institute, met on Thursday, 5th May, 1910, for the purpose of inspecting the Fruit plantations, seeing the work that was being done, and tasting the Cider and Perry made from Fruit grown in the various Cider counties.

Mr. Barker, as on previous occasions after the tasting, gave to an interested audience an object lesson of considerable value on the various yeasts that are desirable or otherwise in the successful fermentation of Cider or Perry; in this way the Visitors had an excellent opportunity of forming some ideas as to the value and necessity of the research work that was being carried out at the Institute.

13. The Governors take this opportunity of requesting all who are either interested in the Institute or in the work it is

doing, to use their influence in urging others to become Members. Members' subscriptions are one guinea per annum, for which they receive all the literature published by the Institute, and can have either six varieties of Apples or Pears or six kinds of Cider or Perry analysed each year. Associates have the same privileges, with the exception that they are unable to vote at the Annual Meeting; while both Members and Associates can visit the Institute and obtain advice from Mr. B. T. P. Barker, upon all matters in connection with the Cider industry.

14. In the Appendix will be found a reprint from the last "Journal" of the Bath and West and Southern Counties Society, containing Reports upon the National Fruit and Cider Institute, from Messrs. B. T. P. Barker and J. Ettle.

W. J. GRANT,
Hon. Sec.

THE NATIONAL FRUIT AND CIDER INSTITUTE.

CASH ACCOUNT FOR THE YEAR 1909.

	£	s.	d.	£	s.	d.
To GRANTS—						
Board of Agriculture	300	0	0			
Bath and West of England Society	100	0	0			
Devon County Council	100	0	0			
Gloucester County Council	100	0	0			
Hereford County Council	100	0	0			
Monmouth County Council	50	0	0			
Somerset County Council	100	0	0			
Worcester County Council	100	0	0			
				950	0	0
To AFFILIATION FEES.						
Bristol University College	1	1	0			
Bristol and District Gardeners' Association	1	1	0			
Berkeley Hunt Agricultural Society	1	1	0			
Mid-Somerset Agricultural Society	1	1	0			
North Somerset Agricultural Society	1	1	0			
Royal Jersey Agricultural Society	1	1	0			
Taunton Deane Agricultural Society	1	1	0			
Monmouth Chamber of Agriculture	1	1	0			
Somerset Agricultural Society	1	1	0			
				9	9	0
To MEMBERS' SUBSCRIPTIONS				73	10	0
To ASSOCIATES' SUBSCRIPTIONS				8	15	0
To SALES				335	18	1
To MISCELLANEOUS—						
Grazing Rent	23	8	9			
University of Bristol, Share of Pupil's fee	5	5	0			
Bank Interest	2	16	8			
				31	10	5
Balance due to Bankers				128	8	0

We hereby certify that the above is a true extract from the Cash Book of the National Fruit and Cider Institute.

(Signed) CURTIS, JENKINS & CO.,
Bristol; 22nd March,, 1910. Chartered Accountants.

£1,537 10 6

	£	s.	d.	£	s.	d.
By Balance due to Bankers				233	11	5
By SCIENTIFIC STAFF—						
Barker B. T. P., Salary	300	0	0			
Reynolds Professor, Investigations	1	7	0			
Sundry Expenses	21	0	9			
				322	7	9
By RENTS, RATES, etc.—						
Ashton Court Estate, Rent	80	0	0			
Interest on Loan / Insurance, Rates, etc.	24	18	10			
				181	5	7
By Repayment of Capital, 1 year	76	6	9			
By Laboratory Fittings				4	15	3
By Machinery, Plant, etc. — Additions to Capital				66	15	8
By Buildings, etc.				7	19	9
By MANAGEMENT ACCOUNT—						
Auditors, Accountant and Correspondents	34	9	0			
Stationery and Printing	52	7	0			
Sundry Expenses	28	16	10			
				115	12	10
By ORCHARDS, PLANTATION & NURSERY ACCOUNT—						
Wages	230	0	6			
Trees and Manure	20	2	6			
Fruit Superintendent, Honorarium & Expenses	50	9	3			
Sundry Bills and Expenses	42	19	10			
				343	12	1
By CIDER MAKING ACCOUNT—						
Wages	87	9	0			
Fruit	84	17	11			
Carriage and Sundries	53	16	4			
				226	3	3
By MISCELLANEOUS—						
Show Expenses	21	11	7			
Sundries	13	15	4			
				35	6	11
				£1,537	10	6

Balance Sheet, 31st December, 1909.

Liabilities.	£	s.	d.	*Assets.*	£	s.	d.	£	s.	d.
LOAN ACCOUNT—				PROPERTY ACCOUNT—						
Balance due to Lady Smyth	79	0	2	Buildings, as 1908 Balance Sheet ..	277	13	9			
LLOYDS BANK—Overdraft	128	8	0	Additions, 1909	7	19	9			
					285	13	6			
				Less depreciation	57	2	8			
								228	10	10
				Laboratory fittings, as 1908 Balance Sheet	47	11	5			
				Additions, 1909	4	15	3			
					52	6	8			
				Less depreciation	10	9	4			
								41	17	4
				Machinery, Plant, etc., as 1908 Balance Sheet	220	18	5			
				Additions, 1909	66	15	8			
					287	14	1			
				Less depreciation	57	10	10			
								230	3	3
				STOCKS AS PER VALUATIONS—						
				Nursery	429	2	0			
				Cider	134	0	0			
								563	2	0
Balance	891	9	10	Sundry Debtors				35	4	7
	£1,098	18	0					£1,098	18	0

(Signed) C. W. RADCLIFFE COOKE, JAMES WATTS, } Governors.

Auditors' Report.—We report that we have audited the Books and Accounts of the Institute for the year ended 31st December, 1909, together with the Balance Sheet made up as on that day and above set forth. All the information and explanations required have been furnished to us. In our opinion the Balance Sheet above referred to is properly drawn up so as to exhibit a true and correct view of the state of the Institute's affairs according to the best of the information and explanations supplied to us, and as shown by the books of the Company.

(Signed) CURTIS, JENKINS & CO.,
Chartered Accountants.

Bristol; 22nd March, 1910.

APPENDIX.

REPORT BY B. T. P. BARKER, M.A., *Director*,

AND

J. ETTLE, F.R.H.S., *Superintendent of Fruit Department.*

The present Report deals with some of the investigations carried on at the Institute during 1908-9 in the cider-house, the laboratory, and the fruit plantations. It has been found difficult to make it much more than an interim report, so far as the majority of the investigations are concerned, since by their nature several seasons' work is required before definite conclusions can be established. It has also been a matter of difficulty to avoid the quotation of numerous statistics; but they have been reduced as far as possible, and those quoted may mostly be regarded as typical selections to illustrate the various points under discussion. Many subjects under investigation have not been dealt with here, in most cases because the work is not sufficiently far advanced to furnish conclusions of value.

THE EXPERIMENTAL CIDER WORK.

Single Variety Trials.

The experimental work in cider-making on a practical scale consisted largely, as in previous seasons, of variety trials. Many varieties not previously tested were procured, some of which gave results of much promise.

The characteristics of the individual ciders and perries made in the cider-house from the selected varieties are given below. The results of trials on a small scale in the laboratory are given in Appendix A. The general results correspond closely with those obtained during the course of the work upon similar lines in previous seasons. They have already been considered at length in the previous Reports of the Institute, and need not, therefore, be recapitulated. Additional

information has been forthcoming on several problems, notably on those concerned with the variations in quality due to the influences of soil and season ; and this will be discussed in the course of this Report as the various subjects concerned are dealt with.

CIDERS.

SHARP VARIETIES—(including those containing normally at least ·45 per cent. Malic Acid).

Ashton Foxwhelp (Somerset).—Analysis of fresh juice, November 18th, 1908 : specific gravity 1·051, malic acid 1·03 per cent., tannin ·276 per cent. Average daily fall in specific gravity at 28°C., ·0075. Filtered December 14th, 1908 : specific gravity 1·031. A medium sweet cider of fair aroma and flavour ; acidity strongly marked ; somewhat thin, although strongly flavoured. A useful, extreme sharp variety for blending.

Backwell Red (Somerset).—Analysis of fresh juice, October 21st, 1908 : specific gravity 1·051, malic acid ·56 per cent., tannin ·050 per cent. Average daily fall in specific gravity at 28°C., ·003. Filtered November 8th, 1908 : specific gravity 1·035. A moderately sweet cider of medium briskness and pleasant aroma ; flavour very fair, although light and somewhat thin. A useful light cider for early work, either unblended or mixed with a heavier type.

Broad Styre (Monmouth).—Analysis of fresh juice, January 14th, 1909 : specific gravity 1·052, malic acid ·77 per cent., tannin ·096 per cent. Average daily fall in specific gravity at 28°C., ·0014. Filtered February 8th, 1909 : specific gravity 1·048. A sharp sweet cider of fair body ; flavour fairly full and pleasant, and aroma fair. Towards the end of April, 1909, a very characteristic cooked-apple flavour developed, which gradually became toned down towards the end of the summer. Too sharp for use alone, but very serviceable for blending with sweet and bitter-sweet ciders.

Bromley (Gloucester).—Analysis of fresh juice, November 24th, 1908 : specific gravity 1·054, malic acid ·85 per cent., tannin ·108 per cent. Average daily fall in specific gravity at 28°C., ·006. Filtered December 7th, 1908 : specific gravity 1.034. A sharp dry cider of moderate quality ; flavour and aroma ordinary, but improving towards the end of the summer. Of value only for the production of a dry blend by mixing with sweet and bitter-sweet juices.

Buck's Kernel (Gloucester).—Analysis of fresh juice, November 11th, 1908 : specific gravity, 1·052, malic acid ·60 per cent., tannin ·116 per cent. Average daily fall in specific gravity at 28°C., ·0049. Filtered November 30th, 1908 : specific gravity 1·035. A medium sweet, fairly brisk cider of pleasant flavour and aroma. Quality very fair, but slightly lacking in body. A palatable light cider for use alone, although improved by blending with a richer type.

Crimson King (Dorset).—Analysis of fresh juice, November 18th, 1908 : specific gravity 1·045, malic acid ·58 per cent., tannin ·108 per cent. Average daily fall in specific gravity at 28°C., ·0046. Unfiltered. A coarse, dry, moderately brisk cider of inferior flavour and aroma. Of little value alone or blended.

Forest Styre (Gloucester).—Analysis of fresh juice, October 28th, 1908 : specific gravity 1·067, malic acid 1·03 per cent., tannin ·188 per cent. Average daily fall in specific gravity at 28°C., ·0019. Filtered November 16th, 1908 : specific gravity 1·046. A very sharp, fairly sweet cider ; flavour and aroma very fair. Not of the highest quality, but very useful on account of the richness of the fresh juice in saccharine matter. Too sharp for use alone, but suited for blending in small quantities with sweet and bitter sweet juices.

Frederick (Monmouth).—Analysis of fresh juice, November 18th, 1908 : specific gravity 1·046, malic acid ·71 per cent., tannin ·108 per cent. Daily fall in specific gravity at 28°C., ·0013. Filtered December 7th, 1908 : specific gravity 1·040. A moderately sweet cider of very marked sharp taste ; flavour and aroma fairly full and pleasant. The cooked-apple taste appeared as with Broad Styre. A useful sharp cider for blending, in spite of the low original gravity of the juice. Decidedly too sharp for use alone.

Greasy Pippin (Somerset).—Analysis of fresh juice, January 9th, 1909 : specific gravity 1·057, malic acid ·65 per cent., tannin ·172 per cent. Daily fall in specific gravity at 28°C., ·0025. Filtered February 15th, 1909 : specific gravity 1·042. A sweet, sharp cider of pleasant flavour and aroma ; slightly lacking in body, but decidedly useful. The cooked-apple flavour developed in late spring. Rather sharp for use alone, but good if toned down slightly with sweet or bitter-sweet juices.

Hackett's Kernel (Gloucester).—Analysis of fresh juice, January 9th, 1909 : specific gravity 1·050, malic acid ·72 per cent., tannin ·092 per cent. Daily fall in specific gravity at 28°C., ·0065. Filtered February 1st, 1909 : specific gravity 1·030. A medium dry, sharp cider of moderate character ; flavour and aroma ordinary. A second-rate variety ; too sharp for use alone.

Kingston Black (Hereford).—Analysis of fresh juice, November 18th, 1908 : specific gravity 1.066, malic acid ·65 per cent., tannin ·186 per cent. Average daily fall in specific gravity at 28°C., ·0021. Filtered January 25th, 1909 : specific gravity 1·038. A sweet brisk cider of good flavour and aroma, and fair body. Good alone, although rather on the sharp side.

Kingston Black (Worcester).—Analysis of fresh juice, November 18th, 1908 : specific gravity 1·064, malic acid ·62 per cent., tannin ·196 per cent. Average daily fall in specific gravity at 28°C., ·0026. Filtered January 4th, 1909 : specific gravity 1.035. A rich, sweet, fruity cider of a nice degree of briskness ; flavour and aroma very good. Excellent alone.

Kingston Black (Devon).—Analysis of fresh juice, November 21st, 1908 : specific gravity 1·056, malic acid ·46 per cent., tannin ·116 per cent. Average daily fall in specific gravity at 28°C., ·0016. Filtered January 4th, 1909 ; specific gravity 1·037. A sweet, rather thin and somewhat insipid cider of slight briskness ; aroma not pronounced and flavour very fair. A useful cider, but lacking in the richness and pleasant briskness natural to the variety on many soils.

Kingston Black (Martock, Somerset). -Analysis of fresh juice, November 21st, 1908 : specific gravity 1·064, malic acid ·52 per cent., tannin ·126 per cent. Average daily fall in specific gravity at 28°C., ·0022. Filtered January 25th, 1909 : specific gravity 1·039. A rich, sweet, full-bodied cider of decidedly soft and rather heavy character ; flavour and aroma very good, although marred by a slight earthy taint. An excellent cider of the Somerset type, with a moderate degree of briskness. Blending unnecessary.

Kingston Black (Edgborough, Somerset). —Analysis of fresh juice, November 21st, 1908 : specific gravity 1·070, malic acid ·56 per cent., tannin ·192 per cent. Average daily fall in specific gravity at 28°C., ·0015. Filtered March 16th, 1909 : specific gravity 1·043. A very sweet, soft, rich, heavy cider of medium briskness ; flavour and aroma excellent. A first-rate cider alone, although rather too much on the heavy side.

Kingston Black (Staplegrove, Somerset).—Analysis of fresh juice, November 21st, 1908 : specific gravity 1·058, malic acid ·41 per cent., tannin ·138 per cent. Average daily fall in specific gravity at 28°C., ·0016. Filtered January 25th, 1909 : specific gravity 1·037. A sweet, rich, soft, full-bodied cider of fair briskness ; flavour and aroma very good and fruity. A fine, rich cider alone.

Kingston Black (Easton-in-Gordano, Somerset).—Analysis of fresh juice, November 28th, 1908 : specific gravity 1·050, malic acid ·44 per cent., tannin ·152 per cent. Average daily fall in specific gravity at 28°C., ·0019. Filtered December 21st, 1908 ; specific gravity 1·036. A medium sweet, somewhat hard cider, of well-marked briskness ; flavour and aroma good. A nice cider, harder than usual for the variety and also rather deficient in body. Blending unnecessary, but the addition of a small quantity of sweet cider is useful to tone down the roughness.

Kingston Black (Long Ashton, Somerset).—Analysis of fresh juice, November 28th, 1908 : specific gravity 1·065, malic acid ·62 per cent., tannin ·198 per cent. Average daily fall in specific gravity at 28°C., ·0014. Filtered February 1st, 1909 : specific gravity 1·035. A sweet cider of similar character to the preceding, with rather more marked briskness and somewhat fuller flavour.

Lady's Finger (Somerset).—Analysis of fresh juice, October 21st, 1908 : specific gravity 1·054, malic acid ·52 per cent., tannin ·094 per cent. Daily fall in specific gravity at 28°C., ·005. Filtered November 16th, 1908 : specific gravity 1·022. A medium sweet, light cider of some briskness ; aroma fairly pleasant, and flavour quite distinct and characteristic. A useful variety for producing a cider of distinct character, although neither rich nor specially pleasing. Blending unnecessary, although a slight addition of a sweet cider may be an improvement.

Lambrook Pippin (Somerset).—Analysis of fresh juice, January 20th, 1909 : specific gravity 1·054, malic acid ·50 per cent., tannin ·196 per cent. Daily fall in specific gravity at 28°C., ·0022. Filtered February 15th, 1909 : specific gravity 1·044. An extremely useful, moderately rich, sweet cider of a nice degree of briskness ; flavour and aroma very pleasant. A good cider for use alone.

Newcomen's (Gloucester).—Analysis of fresh juice, November 28th, 1908 : specific gravity 1·061, malic acid 1·10 per cent., tannin ·262 per cent. Daily fall in specific gravity at 28°C., ·011. Unfiltered. A very characteristic, sharp, dry cider of little aroma, but very marked and peculiar flavour. Quite distinct. Too sharp for use alone, and of little value for blending, in spite of its high gravity, since the flavour is not pleasing.

Overton Red (Worcester).—Analysis of fresh juice, November 5th, 1908 : specific gravity, 1·058, malic acid ·47 per cent., tannin ·062 per cent. Daily fall in specific gravity, ·008. Unfiltered. A thin, dry cider of medium briskness ; aroma very slight, and flavour indifferent. Lacks quality and body for use alone, and of little value for blending.

Page's Yellow (Gloucester).—Analysis of fresh juice, October 28th, 1908 : specific gravity 1·055, malic acid ·68 per cent., tannin ·178 per cent. Daily fall in specific gravity at 28°C., ·0017. Filtered November 23rd, 1908 : specific gravity 1·038. A very useful, sweet cider of well-marked briskness and fair body ; flavour and aroma satisfactory. A useful early-ripening variety ; can be used alone or blended with sweet and bitter-sweet juices.

Passey's Late Crab (Gloucester).—Analysis of fresh juice, January 20th, 1909 : specific gravity 1·043, malic acid ·7 per cent., tannin ·124 per cent. Daily fall in specific gravity at 28°C., ·004. Filtered February 1st, 1909 : specific gravity 1·037. A fairly sweet cider of fair body ; flavour rather sharp, but fairly pleasant, and aroma fair. The juice lacks quality, but the variety is late in ripening, and fairly useful for blending with sweet and bitter-sweet ciders.

Passey's Red (Gloucester).—Analysis of fresh juice, November 5th, 1908 : specific gravity 1·041, malic acid 1·00 per cent., tannin ·028 per cent. Daily fall in

specific gravity at 28°C., ·004. Unfiltered. A sharp, thin, dry cider of unpleasant flavour and aroma. Of little value for any purpose, since the fruit keeps very badly.

Prince of Wales Crab (Somerset).—Analysis of fresh juice, January 20th, 1909: specific gravity 1·050, malic acid ·89 per cent., tannin ·178 per cent. Daily fall in specific gravity at 28°C., ·004. Unfiltered. A sharp, thin cider of moderate quality, with a marked bitter flavour developed during the summer. Of no great value for blending, and unsuited for use alone.

Red Soldier (Gloucester).—Analysis of fresh juice, November 18th, 1908: specific gravity 1·061, malic acid 1·01 per cent., tannin ·288 per cent. Daily fall in specific gravity at 28°C., ·003. Filtered December 14th, 1908: specific gravity 1·039. A sharp, sweet cider of full body and pleasant character. Flavour and aroma good. The variety closely resembles Cap of Liberty, and is possibly identical with it. A valuable sort for blending, but too sharp for use alone.

Reynolds' Kernel (Gloucester).—Analysis of fresh juice, November 5th, 1908: specific gravity 1·041, malic acid ·80 per cent., tannin ·056 per cent. Average daily fall in specific gravity at 28°C., ·0065. Unfiltered. A thin, dry, sharp cider of little merit. Adapted only for blending to yield a dry cider.

Skyrme's Kernel A. (Gloucester).—Analysis of fresh juice, January 9th, 1909: specific gravity 1·068, malic acid ·57 per cent., tannin ·112 per cent. Average daily fall in specific gravity at 28°C., ·0033. Filtered February 15th, 1909: specific gravity 1·044. A fairly full, sweet cider of medium briskness; flavour and aroma pleasant. Slightly too sharp for use alone, but very useful for blending.

Skyrme's Kernel B. (Gloucester).—Analysis of fresh juice, December 17th, 1908: specific gravity 1·065, malic acid ·72 per cent., tannin ·184 per cent. Average daily fall in specific gravity at 28°C., ·0021. Filtered January 11th, 1909: specific gravity 1·041. A cider resembling the preceding closely, but slightly more acid and fuller.

Underleaf (Gloucester).—Analysis of fresh juice, November 11th, 1908: specific gravity 1·048, malic acid ·78 per cent., tannin ·092 per cent. Average daily fall in specific gravity at 28°C., ·006. Unfiltered. A thin, hard, dry cider of decided sharpness; flavour coarse, and aroma moderate. Adapted only for blending to yield a dry cider.

Yellow Styre A. (Gloucester).—Analysis of fresh juice, November 5th, 1908: specific gravity 1·064, malic acid ·56 per cent., tannin ·178 per cent. Average daily fall in specific gravity at 28°C., ·0048. Filtered November 30th, 1908: specific gravity 1·036. A medium sweet, fairly full-bodied cider of moderate briskness; aroma well-marked, and flavour pleasant. A very fair cider alone, but improved by blending with a sweet or bitter-sweet type.

Yellow Styre B. (Gloucester).—Analysis of fresh juice, November 5th, 1908: specific gravity 1·060, malic acid ·83 per cent., tannin ·068 per cent. Average daily fall in specific gravity at 28°C., ·003. Filtered December 7th, 1908: specific gravity 1·044. A sweet, fairly rich cider of well-marked acidity; aroma and flavour pleasant. A very useful cider for blending, but somewhat too sharp alone.

SWEET VARIETIES—(including those containing normally less than ·45 per cent. Malic Acid and ·20 per cent. Tannin).

Ansell (Gloucester).—Analysis of fresh juice, January 20th, 1909: specific gravity 1·064, malic acid ·48 per cent., tannin ·166 per cent. Average daily fall in specific gravity at 28°C., ·0066. Filtered April 5th, 1909: specific gravity

1·032. A rather strong-flavoured cider of good body and strength ; aroma fairly pleasant, but flavour somewhat coarse and bitter. Rather too harsh alone, but useful for blending, especially on account of its strength.

Ashton Brown Jersey (Somerset).—Analysis of fresh juice, January 14th, 1909 : specific gravity 1·051, malic acid ·18 per cent., tannin ·124 per cent. Average daily fall in specific gravity at 28°C., ·0021. Filtered February 15th, 1909 : specific gravity 1·038. A sweet cider of fair body ; aroma very fair, and flavour moderately soft and pleasant. Fairly good unblended, but improved by the addition of a small quantity of a sharper cider.

Bran Rose (Worcester).—Analysis of fresh juice, October 28th, 1908 : specific gravity 1·054, malic acid ·35 per cent., tannin ·166 per cent. Average daily fall in specific gravity at 28°C., ·0085. Filtered November 30th, 1908 : specific gravity 1·023. A medium cider, rather deficient in character ; aroma and flavour moderate. Improved by blending, but of second-rate quality only.

Improved Pound (syn. *Sweet Blenheim*) (Somerset).—Analysis of fresh juice, October 28th, 1908 : specific gravity 1·047, malic acid ·22 per cent., tannin ·090 per cent. Average daily fall in specific gravity at 28°C., ·0098. Filtered November 11th, 1908 : specific gravity 1·014. A thin, coarse, dry cider, of poor flavour and little aroma. Flavour not pleasant enough for use alone, and inferior for blending.

Loram's Sweet White (Devon).—Analysis of fresh juice, November 18th, 1908 : specific gravity 1·056, malic acid ·21 per cent., tannin ·140 per cent. Average daily fall in specific gravity at 28°C., ·0032. Filtered December 14th, 1908 : specific gravity 1·033. A useful sweet cider of rather coarse flavour and aroma. Better blended than alone.

Morgan Sweet (Somerset).—Analysis of fresh juice, October 2nd, 1908 : specific gravity 1·055, malic acid ·11 per cent., tannin ·138 per cent. Average daily fall in specific gravity at 28°C., ·0112. Unfiltered. A coarse, thin, dry cider of moderate aroma, and unattractive flavour, which improves somewhat on keeping. Inferior alone or blended.

Slack-ma-Girdle (Devon).—Analysis of fresh juice, November 28th, 1908 : specific gravity 1·049, malic acid ·19 per cent., tannin ·116 per cent. Average daily fall in specific gravity at 28°C., ·002. Filtered January 4th, 1909 : specific gravity 1·031. A sweet cider of good body ; flavour soft and pleasant, and aroma good. A pleasant, but rather insipid cider alone, but very useful blended with a small quantity of a sharper cider.

Yelland's (Devon).—Analysis of fresh juice, December 5th, 1908 : specific gravity 1·048, malic acid ·29 per cent., tannin ·144 per cent. Average daily fall in specific gravity at 28°C., ·003. Filtered January 21st, 1908 : specific gravity 1·036. A sweet cider of fair quality ; aroma fair, and flavour soft, but lacking in character. Improved by blending with a sharp and bitter-sweet cider.

Bitter-Sweet Varieties—(including those containing normally less than ·45 per cent. Malic Acid, and more than ·20 per cent. Tannin).

Ashton Bitter White (Somerset).—Analysis of fresh juice, October 2nd, 1908 : specific gravity 1·050, malic acid ·17 per cent., tannin ·552 per cent. Average daily fall in specific gravity at 28°C., ·005. Unfiltered. A medium dry cider of markedly bitter character. Aroma fair, and flavour moderate. Too bitter alone, and inferior in quality as compared with some previous seasons

Ashton Early Red Jersey (Somerset).—Analysis of fresh juice, October 2nd, 1908 : specific gravity 1·052, malic acid ·25 per cent., tannin ·362 per cent. Average daily fall in specific gravity at 28°C., ·0057. Filtered November 30th, 1908 :

specific gravity 1·023. A medium cider of somewhat rough character; aroma fair, and flavour rather bitter and distinct. Fairly useful for blending; too bitter alone.

Ashton Russet Jersey (Somerset).—Analysis of fresh juice, November 5th, 1908: specific gravity 1·055, malic acid ·22 per cent., tannin ·288 per cent. Average daily fall in specific gravity at 28°C., ·0048. Filtered November 20th, 1908: specific gravity 1·028. A rather rough, fairly sweet cider, of some bitterness; aroma and flavour fair. Fairly useful for blending.

Ashton White (Somerset).—Analysis of fresh juice October 2nd, 1908: specific gravity 1·050, malic acid ·29 per cent., tannin ·288 per cent. Average daily fall in specific gravity at 28°C., ·0049. Unfiltered. Very similar in character to Ashton Bitter White, but rather less bitter.

Belle Norman (Monmouth).—Analysis of fresh juice, November 11th, 1908: specific gravity 1·048, malic acid ·22 per cent., tannin ·250 per cent. Average daily fall in specific gravity at 28°C., ·007. Filtered November 30th, 1908: specific gravity 1·021. A rather thin, medium dry cider of mild bitter character; aroma not marked, and flavour of no particular merit. A fairly useful cider for medium dry blends, but lacks body and richness.

Brown Snout (Hereford).—Analysis of fresh juice, December 17th, 1908: specific gravity 1·057, malic acid ·29 per cent., tannin ·234 per cent. Average daily fall in specific gravity at 28°C., ·0022. Filtered January 11th, 1909: specific gravity 1·035. A rich, sweet cider of full body and slight bitterness; aroma good, and flavour pleasant. Slightly too bitter for use alone, but valuable for blending with a sharper cider.

Cherry Norman (Hereford).—Analysis of fresh juice, November 11th, 1908: specific gravity 1·048, malic acid ·17 per cent., tannin ·276 per cent. Average daily fall in specific gravity at 28°C., ·0027. Filtered December 14th, 1908: specific gravity 1·033. A fairly sweet, medium bitter cider of fair body and slight bitterness: aroma pleasant, and flavour good, although lacking somewhat in character. A very useful cider for blending.

Chisel Jersey (Somerset).—Analysis of fresh juice, January 14th, 1909: specific gravity 1·054, malic acid ·23 per cent., tannin ·244 per cent. Average daily fall in specific gravity at 28°C., ·0031. Filtered February 15th, 1909: specific gravity 1·035. A sweet, rather rich and full bodied cider with rather marked astringency; aroma very fair and flavour pleasant. Very useful for blending.

Cummy Norman (Hereford).—Analysis of fresh juice, November 11th, 1908: specific gravity 1·061, malic acid ·27 per cent., tannin ·252 per cent. Average daily fall in specific gravity at 28°C., ·0058. Filtered December 14th, 1908: specific gravity 1·023. A rather coarse, strong, medium cider of somewhat bitter flavour and moderate aroma. Requires blending, and yields a second-rate cider; of some use on account of its strength, but too coarse for delicate blends.

Knotted Kernel (Hereford).—Analysis of fresh juice, November 5th, 1908: specific gravity 1·052, malic acid ·21 per cent., tannin ·334 per cent. Average daily fall in specific gravity at 28°C., ·0032. Filtered December 7th, 1908: specific gravity 1·031. A sweet, rather rich cider of good quality; flavour pleasant but bitter, and aroma well-developed and pleasing. Too bitter for use alone, but good for blending. One of the most promising of the early season bitter-sweets.

Prince Albert (Gloucester).—Analysis of fresh juice, November 5th, 1908: specific gravity 1·049, malic acid ·21 per cent., tannin ·244 per cent. Average daily fall in specific gravity at 28°C., ·01. Unfiltered. A coarse, rather bitter cider of inferior aroma and flavour. Requires blending.

Royal Wilding (Hereford).—Analysis of fresh juice, January 14th, 1909 : specific gravity 1·064, malic acid ·24 per cent., tannin ·322 per cent. Average daily fall in specific gravity at 28°C., ·0032. Filtered April 4th, 1909 : specific gravity 1·045. A very sweet, rich, full-bodied cider of bitter character ; flavour and aroma good. Requires blending, and then produces a first-rate cider.

Royal Jersey (Somerset).—Analysis of fresh juice, November 11th, 1908 : specific gravity 1·053, malic acid ·17 per cent., tannin ·272 per cent. Average daily fall in specific gravity at 28°C., ·001. Filtered December 28th, 1908 : specific gravity 1·037. A rich, sweet cider of medium bitterness ; flavour soft and pleasant, and aroma well-marked and good. Requires blending to yield an excellent cider.

Spreading Norman (Hereford).—Analysis of fresh juice, November 26th, 1908 : specific gravity 1·058, malic acid ·20 per cent., tannin ·426 per cent. Daily fall in specific gravity at 28°C., ·0057. Filtered January 4th, 1909 : specific gravity 1·030. A useful, medium sweet cider of marked bitter character ; flavour and aroma pleasant. Very useful for blending.

Strawberry Norman (Hereford).—Analysis of fresh juice, January 20th, 1909 : specific gravity 1·057, malic acid ·27 per cent., tannin ·254 per cent. Average daily fall in specific gravity at 28°C., ·003. Filtered February 15th, 1909 : specific gravity 1·042. A good, sweet cider of fair richness and body Flavour mildly bitter and pleasant, and aroma very fair. A very useful cider for blending, but too bitter and insipid alone.

Tremlitt's Bitter (Devon).—Analysis of fresh juice, October 16th, 1908 ; specific gravity 1·046, malic acid ·21 per cent., tannin ·266 per cent. Average daily fall in specific gravity ·0031. Filtered October 30th, 1908 : specific gravity 1·026. A thin, medium, sweet cider of slight bitterness ; flavour and aroma moderate. An early mild bitter-sweet of useful quality, which requires blending with a brisker type.

White Jersey (Somerset).—Analysis of fresh juice, December 3rd, 1908 : specific gravity 1·060, malic acid ·28 per cent., tannin ·232 per cent. Average daily fall in specific gravity at 28°C., ·0025. Filtered January 4th, 1909 : specific gravity 1·035. A good, mildly bitter, rich, sweet cider ; aroma well-marked and pleasant, and flavour soft and good. Can be used alone, but better blended with a brisker type, and then gives an excellent cider.

Yarlington Mill Jersey (Somerset).—Analysis of fresh juice, December 5th, 1908 : specific gravity 1·050, malic acid ·24 per cent., tannin ·308 per cent. Average daily fall in specific gravity at 28°C., ·003. Filtered December 21st, 1908 : specific gravity 1·032. A fairly sweet cider of medium bitterness ; aroma and flavour very fair. Too bitter alone, but useful for blending.

The two following kinds were sent in as Cherry Norman and Knotted Kernel respectively, but they are quite distinct from the true forms of those varieties.

Cherry Norman (spurious) (Hereford).—Analysis of fresh juice, January 14th,1909 : specific gravity 1·056, malic acid ·22 per cent., tannin ·288 per cent. Average daily fall in specific gravity at 28°C., ·0026. Filtered February 3rd, 1909 : specific gravity 1·043. A sweet, full cider of somewhat bitter character ; aroma very fair and flavour pleasant. A useful late variety for blending, but rather too bitter alone.

Knotted Kernel (spurious) (Hereford).—Analysis of fresh juice, December 17th, 1908 : specific gravity 1·061, malic acid ·31 per cent., tannin ·212 per cent. Average daily fall in specific gravity at 28°C., ·0044. Filtered January 25th, 1909 : specific gravity 1·027. A medium sweet, mildly bitter cider of fair, but somewhat coarse character ; flavour and aroma fair. Fairly useful for blending, but too coarse and bitter alone.

PERRY.

Blakeney Red (Gloucester).—Analysis of fresh juice, October 16th, 1908 : specific gravity 1·047, malic acid ·48 per cent., tannin ·088 per cent. Average daily fall in specific gravity at 28°C., ·005. Filtered October 30th, 1908 : specific gravity 1·026. A thin, medium perry of suitable briskness, but ordinary flavour and aroma. Lacking in body for use alone, but moderately useful for blending with heavier juices.

Bull (Gloucester).—Analysis of fresh juice, November 18th, 1908 : specific gravity 1·057, malic acid ·58 per cent., tannin ·140 per cent. Average daily fall in specific gravity at 28°C., ·0036. Filtered December 14th, 1908 : specific gravity 1·042. A sweet, full-bodied perry, of marked astringency ; flavour and aroma good. The astringency is too marked for use alone until the perry is thoroughly matured, but the variety is valuable for blending.

Oldfield (Gloucester).—Analysis of fresh juice, November 5th, 1908 : specific gravity 1·065, malic acid ·83 per cent., tannin ·254 per cent. Average daily fall in specific gravity at 28°C., ·0028. Filtered February 1st, 1909 : specific gravity 1·041. A rich, sweet, full-bodied perry of excellent flavour and aroma. The acidity is somewhat more marked than usual with this variety. Good alone, but improved by suitable blending to tone down the acidity.

Pint (Gloucester).—Analysis of fresh juice, November 18th, 1908 : specific gravity 1·044, malic acid ·76 per cent., tannin ·074 per cent. Average daily fall in specific gravity at 28°C., ·0065. Unfiltered. A thin, coarse, rough perry of some acidity. Inferior for any purposes.

The Classification of Varieties for Vintage Purposes.

The work on single variety ciders and perries has not only furnished valuable information on the general problems of cider and perry-making, but it has also built up a knowledge of the respective values and uses of the majority of the best known vintage varieties, of many less widely grown, and of some practically unknown kinds. We are, therefore, now in a position to utilise these varieties to the best advantage, so far as the present state of knowledge of the science of cider-making allows. It has been found possible to divide the varieties into a series of groups, each of which may be represented by a more or less well-known variety as the type ; and the method of treatment recommended for this sort may be taken as suitable for the other individual members of the same group. Thus, for instance, one of the three main classes of cider apples, the " sharps " or " sours," may be divided up into a series of groups, represented respectively by Cap of Liberty, Kingston Black, Fair Maid of Devon, and Underleaf, with others which need not here be specified, as the type varieties. The Cap of Liberty group is normally characterised by the juice containing a comparatively large percentage of malic acid and a moderately large percentage of tannin, and fermenting also at a comparatively slow rate. Apples of this group are adapted for the production of a sweet cider of good quality after suitable blending. The kind of blending required

is the addition of about equal parts of a variety of the class of "sweet" apples, belonging to a slow-fermenting group—which may be typified by Sweet Alford—and of a variety of a slow-fermenting, pronounced "bitter-sweet" type—of which Royal Jersey or Strawberry Norman may be quoted as examples: or an equally satisfactory blending may be obtained by the use of about two parts of a slow-fermenting, mild "bitter-sweet" apple of the Horner type. The Kingston Black group of sharp apples, while normally resembling the Cap of Liberty group in the slow rate of fermentation of the juice and the possession of a medium percentage of tannin, shows, on the other hand, only a medium percentage of malic acid. Its members are, therefore, also adapted for the production of a sweet cider; but, since the acidity is only moderate, for many palates blending is not required. For those who prefer a less brisk cider the same lines of blending may be followed as for the Cap of Liberty group, but not more than half the quantities of "sweet" and "bitter-sweet" apples given in connection with that case are here necessary. Well-known members of the Kingston Black group which may be mentioned are Cowarne Red, Skyrme's Kernel, Porter's Perfection, and Lambrook Pippin; while Foxwhelp, Red Soldier, Dufflin, Red Butcher, and Forest Styre are of the Cap of Liberty type. The Underleaf and Fair Maid of Devon types correspond respectively with the Cap of Liberty and Kingston Black types so far as the normal degree of acidity of the juice is concerned; but they differ in that the normal percentage of tannin is low, and the normal rate of fermentation of the juice rapid. The kind of blending necessary will correspond relatively with that for the two aforementioned examples; but "sweet" and "bitter-sweet" varieties with rapid-fermenting juices should be used, and the proportion of "bitter-sweets" required will be higher on account of the deficiency of tannin in the sharp apples of these groups. Members of these groups are only adapted naturally for the production of dry ciders. Most of the dessert and culinary varieties of apples fall into the Fair Maid of Devon group, while Bromley and Reynolds' Kernel may be classed with the Underleaf type.

A complete classification of all the varieties of apples examined at the Institute is now being drawn up on the lines thus briefly outlined, and will be ready for publication shortly. It is not to be expected that it will solve all the difficulties as to the methods for utilising and blending apples for cider, or that it will be found to hold good in every instance. With more complete knowledge of the varieties dealt with, some will doubtless be found

to be grouped incorrectly. Some of the groups themselves may require modification. Revision will certainly be necessary from time to time; while the addition of other varieties not yet investigated will gradually make the scheme more useful and complete. In spite, however, of its necessarily tentative nature it can hardly fail to prove of real value to every maker who wishes to utilise his vintage fruit to best advantage. It is not that the scheme as first published is likely to be of immediate benefit to more than the few makers who may be fortunate enough to have to deal mainly with varieties already included in the list. On account of the very large number of varieties utilised for cider-making in different districts it will certainly be found that, in the average case, at the most only a few of the varieties with which the maker has to deal will be found in the classified list. To extract full value from such a scheme of classification it will be necessary for individual growers and makers to submit to the Institute for examination varieties not already included, so that they may be referred in due course to their proper place in the scheme. Thus the future development of the scheme rests very largely in the hands of the makers themselves, since it is impossible for a central station like the Institute to get directly into touch with the local problems of any district, unless those resident in the locality concerned take their part in the matter. The Institute is always ready and willing to examine any varieties submitted, so far as time and other work permit. This is the first systematic attempt to thoroughly classify for vintage purposes the vintage fruit of this country, and it is hoped that all growers and makers will endeavour to assist in making the work as complete and representative as possible.

In this manner an endeavour is being made to turn to practical use for cider-makers the knowledge of individual varieties which has been gained during the course of this single-variety work. It is, however, a matter of great difficulty to decide what should be considered the normal qualities of any individual variety under investigation, and for what purposes it is best adapted. This difficulty is created by the fact, known to every cider-maker, that a variety rarely gives exactly corresponding results in any two consecutive seasons, even if the samples examined are taken from the same tree. The matter is still further complicated by soil and other local influences, the results obtained with samples of the same variety taken from different localities, or even from different orchards in the same locality, differing, often materially, even in the same season. In order that our knowledge of variety characters may be based upon a thoroughly satisfactory foundation, it is necessary that the

influences of the various factors at work in determining the quality of the fruit for vintage purposes should be understood, and the relative parts played by each in producing the result of their combined action elucidated. Hence it has been found necessary to investigate separately, as far as possible, the influence of some of these factors, and, when suitable opportunity arises, others will also be studied. The amount of time required for such work is considerable ; and, since in many cases the factor of seasonal influence must be eliminated, the same ground must be covered for a number of successive years before any conclusions can be considered fully substantiated. Much of the work also has to be crowded into a comparatively few weeks,—that period of the year when the fruit is available for cider-making,—so that it has to be run concurrently with the experiments on purely practical methods. It is evident, therefore, that owing to the lack of assistant scientific staff at the Institute, the work in the one direction can only be done at the expense of the other. Since, however, as was stated in last year's Report, it has been demonstrated that the dominant factor in determining the quality of a cider is that of the quality of the fruit, and since there is at the present time no subject connected with cider-making which has received so little attention, and on which knowledge is so urgently required, as that of the influence of those factors which affect the quality of the fruit for vintage purposes, the attention which is now being given to that side of cider research ought not to require further justification ; although its connection with practical cider-making may not appear to the maker at first sight to be very close, and may not, therefore, appeal to him to the same extent as experiments on purely practical methods. It may further be pointed out that, until scientific knowledge of the groundwork of the subject is attained, efforts to improve the practical methods at present accepted as the most satisfactory, are greatly handicapped by the necessity of working in the dark with regard to the manner of operation of certain essential factors.

The Variation in Quality of a Vintage Variety.

Before dealing with the results obtained from the investigations of the behaviour of those factors which have already been studied at the Institute, it will be necessary to show in what directions and to how great an extent individual ciders made from the same variety of apple differ. Some of the features have already been considered in earlier Reports, so that a brief summary only need be given here.

The chemical composition of the cider is one of the most striking features to show variation. The amount of sugar present is especially of practical importance, and frequently differs greatly, not only in the fresh juice, but also in the mature cider. Thus, of a number of Kingston Black ciders, made during 1908-9 at the Institute, the highest specific gravity obtained in the fresh juice was 1.075, which is equivalent, approximately, to 16¼ per cent. of sugar, while the lowest gravity was 1.050, representing only an approximate percentage of sugar of 10. Assuming both ciders to be completely fermented, the difference in the amount of alcohol in the finished products would be as much as 3 per cent. Since, however, the rates of fermentation of the different juices also vary considerably, the original amounts of sugar in the fresh juices do not necessarily correspond relatively to those in the finished article, and small differences in the original juices may be considerably enlarged later. A very good example may be quoted from the Report for 1906, where two lots of Strawberry Norman were tested on a small scale in the laboratory, and allowed to ferment naturally under identical conditions until fermentation ceased. The fresh juices had specific gravities of 1.051 and 1.060 respectively, representing a difference of about 2 per cent. of sugar. Twelve months later the gravities of the respective ciders were 1.013 and 1.035 respectively, the difference in the sugar present being approximately 5½ per cent. Differences of a similar character may be shown also for the other constituents of cider, both in the fresh juice and the mature cider. The accompanying table of analyses of Kingston Black juices, made during the autumn of 1908, contains a selection of results to illustrate these differences in the fresh juice.

KINGSTON BLACK ANALYSES, 1908.

Locality where Grown.	Percentage Composition of Fresh Juice.		
	Specific Gravity	Malic Acid.	Tannin.
Long Ashton, Somerset. A. ..	1.075	.50	.254
„ „ „ B. ..	1.062	.76	.272
Berkeley, Gloucester ..	1.066	.39	.172
Easton-in-Gardano, Somerset	1.050	.44	.152
Ash, Devon	1.068	.44	.242
Martock, Somerset ..	1.071	.67	.192
Newnham, Worcester ..	1.058	.53	.186
Budlake, Devon	1.056	.46	.116

The differences in the amounts of malic acid and tannin shown in this table are sufficiently marked to influence materially the flavour of the mature ciders. Other variations in flavour, due to

characters which do not lend themselves so easily to expression by chemical analysis, were even more marked. For instance, the Kingston Black ciders made from Devon-grown fruit were soft on the palate, but lacking in briskness, body, and general character; those from South Somerset fruit were soft, fruity, and full of body, but of a heavy type; those from North Somerset fruit were brisk and full-flavoured, but decidedly harsh; and those from Worcester and Hereford fruit were brisk, fruity, and of fair body, softer than the North Somerset type, but less heavy and harsher than the South Somerset ciders. The flavour, apart from the degree of sweetness, therefore, varies greatly.

The natural degree of sweetness of a mature cider depends on the rate of fermentation of the juice. Of course the methods of manufacture adopted can materially affect the sweetness also; but, since they are artificial in character, and bear no relation to the quality of the fruit or cider as it is determined by purely natural processes, they do not come into the question in this connection. The example of the two Strawberry Norman ciders, already quoted in connection with the variation in sugar content, illustrates the extent to which the rate of fermentation can vary in juices of the same variety, the fall in gravity in the one case being from 1.051 to 1.013—a drop of 38 points—in a year, and in the other case from 1.060 to 1.035—a drop of 25 points—in the same period of time. It is, however, more strikingly marked in the following cases, which occurred during the past autumn. Two samples of Kingston Black juice, the one obtained from fruit grown on old trees and the other from fruit grown on young trees at the Institute, were kept at a temperature of 27° C. The specific gravity of the fresh juice in the former case was 1.047, and in the latter case 1.045. After five days the specific gravity of the former stood at 1.038, and of the latter at 1.008. Variations in the rate of fermentation may, therefore, under some circumstances, be as great between juices of the same variety as between juices of different kinds of apples.

The clearing property of the cider is another feature showing considerable variation. Experiments with the juice of Ashton Early Red Jersey apples taken at different stages of ripeness of the fruit showed that the cider made from the unripe fruit cleared slowly, and the fining was accompanied by the deposition of a comparatively small amount of mucilaginous material. The cider from perfectly ripe fruit cleared quickly and thoroughly, the juice "dropping bright" at an early stage, and much mucilaginous material being thrown down in the form of a clot. The cider from over-ripe fruit generally cleared very slowly and irregularly, some haziness

persisting; while the mucilaginous material thrown down was large in amount and flocculent in character. These results hold good generally for apples of the sweet and bitter-sweet classes with low acidities. Sharp apples behave similarly as regards the rate and efficiency of clearing; but the behaviour of the mucilaginous constituents differs somewhat.

The keeping qualities of ciders made from the same variety also show great differences. The varying extent of resistance to sickness and other disorders was very well illustrated during the past summer at the Institute by the different Kingston Black ciders made there the previous autumn, some being very susceptible to sickness and others remaining unattacked, or only slightly attacked, and that with difficulty. While the evidence on this point is decisive as far as it goes, it is not yet sufficiently precise to warrant definite conclusions as to the causes which predispose some ciders more than others to attack by such disorders, there being evidently other factors, in addition to the character of the cider, playing an important part.

Such, then, are the most striking points of variation in ciders made from the same variety of apple, which have been noticed during the course of the work at the Institute. There are many other features in which variation is shown by the same variety under different conditions; but these are more of a horticultural than a purely vintage character, and it is not proposed to consider here any but those affecting more or less directly the vintage qualities of the fruit and cider. The differences in character which have been described are so marked that it seems at first sight to be almost impossible to decide absolutely the value of a variety for vintage purposes. They certainly illustrate the difficulties which must be faced in making a definite decision. But it must be recognised at the same time that these differences represent generally extreme cases, and that normally there is much greater correspondence in the characters. Some of the differences also are due to factors to some extent within the grower's or maker's control. In spite of these differences there is undoubtedly in average cases a fair measure of consistency in the behaviour and characters of any individual variety, as has been pointed out in previous Reports. The real difficulty lies in deciding how far the characters which are observed in any particular instance are typical of the variety, and how far they are abnormal; and it is in this direction that the investigations about to be described are especially important.

Having thus pointed out the differences which may be met with, the influence of the various individual factors affecting quality may be considered.

Factors Influencing the Quality of Vintage Fruit

The Degree of Ripeness of the Fruit.—It has already been proved that the degree of ripeness of the fruit at the time of cider-making has a great deal to do with the quality of the product, not only the chemical composition of the juice, and consequently the flavour, being affected, but also the rate of fermentation. In order to get the best results from the fruit, therefore, it is important for the maker to mill it when it is at its period of highest quality. In practice, however, it is difficult to decide with certainty when this point is reached. In the hope that some definite information of practical service in this connection might be gained, a series of tests has been conducted at the Institute with fruit picked from one tree and made up into cider at intervals from the time when it was fit to be gathered from the tree until it began to decay from over-ripeness. The fruit selected was as even in quality as possible. The differences in the chemical composition of the fresh juices and in their rates of fermentation are given in the following table :—

Name of Variety.	Date of Pressing.	Specific Gravity of Juice.	Percentage Composition of Juice.		Rate of Fermentation. Average daily drop in Specific Gravity at 27 deg. C. (See Appendix B.)
			Malic Acid.	Tannin.	
Red Vallis ..	Oct. 7	1.040	.66	.120	—
	Oct. 13	1.041	.69	.124	—
	Oct. 27	1.039	.75	.080	5.0
	Nov. 4	1.039	.66	.104	6.6
	Nov. 11	1.044	.80	.108	5.2
	Nov. 20	1.041	.72	.120	5.5
	Nov. 29	1.036	.70	.116	5.8
	Dec. 7	1.045	.61	.090	6.7
Red Butcher ..	Oct. 27	1.050	1.26	.148	2.1
	Nov. 5	1.051	1.68	.156	2.1
	Nov. 11	1.058	1.45	.108	3.8
	Nov. 20	1.057	1.52	.180	3.2
	Dec. 1	1.047	1.35	.146	4.4
	Dec. 7	1.052	1.20	.180	4.5
Kingston Black (old tree.)	Oct. 28	1.047	.65	.120	2.6
	Nov. 4	1.048	.60	.148	3.7
	Nov. 11	1.048	.50	.100	4.7
	Nov. 20	1.049	.49	.160	7.7
	Nov. 29	1.047	.46	.098	2.0
	Dec. 7	1.052	.57	.134	4.4
Kingston Black (young trees.)	Oct. 28	1.043	.68	.160	3.3
	Nov. 4	1.045	.48	.116	9.3
	Nov. 11	1.049	.46	.084	9.2
	Nov. 20	1.048	.43	.124	8.5
	Nov. 29	1.045	.40	.082	7.2
	Dec. 7	1.051	.46	.110	7.0

The results in these trials would undoubtedly have proved of more value if the series had been started earlier in the season. From their general tendency, and from what has been learnt by experience with other varieties during the past autumn, the course and time of ripening have been abnormal this season. In an average season none of the varieties utilised would be considered fit for pressing until late in November at the earliest. This season they were fit to press immediately after gathering; and the general course of the results quoted indicates that the fruit throughout ought to be considered, if anything, on the over-ripe side. It is not possible to draw any satisfactory conclusion as to the changes in chemical composition of the juice during the ripening period, since with each variety the results of the analyses are somewhat irregular and apparently bear no relation to the time of pressing. Probably the irregularity was accounted for to a great extent by the nature of the season, since the fruit kept very badly after being gathered and some of it wilted considerably, the loss of water in such cases tending to make the results fictitious. The behaviour of the mucilaginous constituents of the juices was more normal, and showed that the fruit at the start of the work was practically at the stage of perfect ripeness. The rates of fermentation, while presenting certain features not easy to understand in the light of previous results—notably the results for the Red Vallis juice of November 4, the Kingston Black juices of November 29 and December 7, from the old tree, and those from the young trees after November 11—show on the whole a decided acceleration from the start. There is little doubt that in each case the best cider would have been made from the fruit in its condition on about October 28, and that possibly still better results would have been obtained at a yet earlier date.

However inconclusive these results may have proved as regards the furnishing of definite information as to the influence of the degree of ripeness of the fruit upon the quality of cider, they certainly show the necessity of accepting with caution the results of a single examination of any variety. If, for example, the Kingston Blacks from the old tree had been examined only on November 20, that variety might have been regarded as of little value for the purpose of producing sweet cider on account of the high rate of fermentation; whereas the results for the other dates prove that it is well adapted for that purpose. In order to put the trial of any variety on a really sound basis, therefore, it is really necessary to obtain a supply of fruit direct from the trees immediately it is fit to be gathered, for examination in the laboratory at weekly or fortnightly intervals over a period of eight or ten weeks.

The Age of the Tree.—In the Report for last season the question of the influence of the age of the tree upon the vintage qualities of its fruit was discussed briefly in connection with the results which were obtained with Foxwhelp apples from trees of different ages. It was shown that the rate of fermentation of the juice from fruit taken from a 20-year-old tree was much more rapid than those of juices from a recently-grafted young tree and from a tree at least 60 to 70 years old: and it was suggested that the differences might be due to the difference in the vigour of growth of the respective trees. Not only did the rates of fermentation of the respective juices vary considerably, but there were also marked differences in their chemical composition. It was obviously not possible to draw any general conclusions on the matter from this single instance; and it seemed desirable to obtain further information, since, if there is any material difference in the vintage quality of fruit of the same variety from trees of different ages, it is important from the practical point of view not to mix such fruit together at the time of gathering. It is not, however, an easy matter to obtain much information on the subject, since young, middle-aged, and old trees of the same variety are rarely, if ever, to be found growing together under the same conditions: and it is clearly impossible to take for comparison the produce of trees growing in different localities, since the effect produced by local conditions could not be eliminated from the result. The most satisfactory information has been obtained from Kingston Black fruit grown at the Institute, one lot being taken from an old tree in the Old Orchard, and the other from five young 10-year-old trees in the Young Orchard. It was unfortunate that there was not sufficient fruit produced by each of the young trees to be dealt with separately throughout the course of the investigation, since, as will be seen from the accompanying table, there is reason to believe that the results from the mixture do not necessarily represent very closely those which would have been obtained from the individual trees. Enough fruit was obtained from each tree for a single test to be made, but in order to carry out a series of successive tests on the lines described in the preceding section dealing with the influence of the degree of ripeness of the fruit, it was necessary to mix the remainder. The results, therefore, cannot be taken as entirely independent of the factor of the individuality of the tree; and, moreover, they do not probably represent even an average for the five trees concerned, since the quantity of fruit used from each tree was not the same, on account of the smallness of the crop. They do, however, probably serve for the comparison of the influence

of youth and old age as nearly as can be obtained at the present time, since all other conditions, apart from minor soil variations which are bound to occur even in soils of essentially the same character in adjacent orchards,—as in the present case,—were identical.

The results of the examination of the fruit from the young and old trees at different stages of ripeness, have already been given in the table in the preceding section. Those in the following table supplement these and show the extent of the variation in the case of the four individual young trees on the single occasion when their produce was examined separately.

Number of Tree in Young Orchard.	Date of Pressing.	Specific Gravity of Juice.	Percentage Composition of Juice.		Rate of Fermentation. Average daily drop in Specific Gravity at 27 deg. C.
			Malic Acid.	Tannin.	
1. ..	Nov. 9	1.047	.47	.054	5.0
2. ..	Nov. 9	1.042	.53	.074	7.5
3. ..	Nov. 9	1.047	.53	.060	10.5
5. ..	Nov. 10	1.049	.50	.086	9.2
4-Yr. old Tree in Nursery ..	Nov. 10	1.046	.43	.044	11.0
Results for corresponding date from preceding table.					
Young trees mixed	Nov. 11	1.049	.46	.084	9.2
Old tree ..	Nov. 11	1.048	.50	.100	4.7

There can be little doubt from the data given in this and the preceding table that there is, in the majority of cases at least, an appreciable difference in the rates of fermentation of young-tree and old-tree juices taken at any given dates ; and it is also clear that, throughout the whole period over which the investigation extended, the former was more rapid than the latter Hence there is, if these results are taken in conjunction with those dealt with in last year's Report, a strong presumption in favour of the view that the vintage quality of the fruit of any tree varies according to the age of the tree ; and that, since the rate of fermentation is relatively slow for old-tree juices, the cider produced from the latter will tend to be sweeter and of better flavour than that from young trees. In other words, a tree does not reach its highest point of vintage quality until late in life.

It will be noticed that the variations in the chemical composition of the juice are comparatively slight, the results in this way differing from those obtained last year with the Foxwhelp juices. Seeing

that it has been found that in many respects the results for the 1909 juices are quite abnormal, doubtless owing to the unusual nature of the season, any conclusions on questions affecting the chemical character of the juice must perforce be postponed until the results of similar work in succeeding and more normal seasons show to what extent allowance must be made for this factor. From past experience, it is clear that the specific gravity of the Kingston Black juices has averaged in 1909 at least 10 points lower than the normal ; while the percentage of tannin is also very low and the rate of fermentation higher than usual. Somewhat curiously, the acidity has not differed much from the normal. Similar features have been noticed for almost all the other varieties examined, in some cases to a much more pronounced extent. Bitter-sweet and sweet varieties, however, in contradistinction to the sharp varieties have shown, as a rule, acidities decidedly above the average.

When comparing the results for the young trees in the foregoing table, some allowance ought probably to be made for differences in treatment of the trees. Tree 1 has had the grass removed around the base of the stem for a radius of 4 feet 6 inches, and Trees 2 and 5 for a radius of 3 feet ; while the grass has been allowed to grow up to the base of the stem in Tree 3. This distinction in treatment has been in operation since the spring of 1905, one season after planting, each tree for its first season having had the grass cleared for a radius of 3 feet. Since it has been amply proved by the Woburn experiments, and verified by other experiments at the Institute and elsewhere, that grass exerts a prejudicial influence on the growth of the tree, and also affects both the colour of the fruit and its time of ripening, it is probable that the results quoted for the individual trees have been influenced by the grassing experiments ; but further consideration of this point may be deferred until the results for other varieties are dealt with in a subsequent section of this Report.

Little can be said at present as to the ultimate cause of the difference in vintage qualities of the fruit of young and old trees. That it is concerned very closely with the vigour of growth appears highly probable ; but, in comparing the results for any definite date, some allowance should undoubtedly be made for the different stages of ripeness of the fruit. The fruit from young trees is evidently, as a rule, some distance ahead of that from old trees as regards condition of ripeness. The better exposure of the fruit to the sun on young than on old trees, and consequently its higher colouring, must also have a moderating influence on the rate of fermentation.

In view of these results, those who desire to make sweet cider ought undoubtedly to use for that purpose fruit from old rather than young trees, where possible, and to avoid, as far as can be reasonably done, the mixture of the produce of young and old trees.

The Soil.—An outline of the nature and course of the investigations now in progress upon soil influence on the quality of vintage fruit was given in last year's Report. Since its publication the work has been continued, and the examination of the chemical and physical characters of several of the selected soils has been practically completed. The vintage characters of the fruit grown on these soils have also been tested and compared, as far as is possible on a single season's results: but since the nature of the season has so considerable an effect on vintage quality, it is obviously impossible to arrive at definite conclusions until purely seasonal influences have been eliminated as completely as possible by several years' trials. Other factors such as the degree of ripeness of the fruit at the time of examination, the age of the tree, etc., must also be eliminated. Nevertheless, the results already to hand are suggestive in many ways, and may be expected to have a material influence upon the future course of the investigations. The connection between the chemical composition of the soil and the vintage quality of the fruit is not thus far apparent; but there is evidence that the physical characters of the soil exert a direct influence. All the soils already examined are of the heavy type, but the individual samples vary considerably as regards the proportions of relatively fine and coarse particles of which they are composed. No great differences in the rate of fermentation of the juices of the respective soils were observed, all being decidedly slow. This result, however, is not unexpected, since Kingston Black, the variety tested, almost invariably yields a slow-fermenting juice when grown on soils more or less heavy in character, particularly when the fruit is taken from comparatively old trees, as was the case in most of the present examples. Any difference in this direction produced by soil influences in the cases already dealt with could only be expected to be very slight. Differences in the flavour and character of the ciders were, however, observed; and these corresponded to a rather striking extent with those in the texture of the respective soils. The general tendency was for the soils containing the greater percentages of the finer particles to yield ciders of fuller flavour and body and of softer character than those in which the coarser particles were more numerous. That is to say, the more the soils approached the stiff clay character the more full-bodied and softer were the ciders, while the reverse was the case with soils

approximating to the sandy type. This apparent influence of the physical character of the soil may be due directly to the influence of the texture upon root development and action; but it may also be due to differences in the amount of moisture retained in the soil. Clay soils, being composed mainly of very fine particles, contain a greater amount of pore-space and, therefore, of space available for water storage than sandy soils, which consist mainly of larger particles. If there is anything in the latter possibility, the more moisture there is contained in the soil the more full-bodied should be the cider, so long as the amount of moisture does not surpass the point beyond which the healthy development of the tree is affected. The examination of the produce of the individual trees in the Young Orchard at the Institute, lends colour to this possibility. Most of the trees in this orchard produced sufficient fruit for examination and analysis this season. The comparative rates of fermentation of the juices from the individual trees were specially studied in order to see if there was any relation between them and the method of treatment of the individual trees. Taking the orchard as a whole, no relation could be determined, the results apparently being quite irregular. The only regularity in the results was observed in the case of the trees bordering on the end of the orchard adjoining the road. There are in all fourteen rows of trees in the orchard, running at right angles to the road. The varieties in each row differ; but starting at the road end there are in every case three or more consecutive trees of each variety. The level of the orchard at the road end lies from three to six feet above that of the road, which is separated from the orchard by a stone wall. In ten of the rows the trees fruited sufficiently to allow of examination. In every instance, the juices from the first, or first two, trees in the row, starting at the road end, fermented at an appreciably faster rate than their immediate successors in the same row. Since the strip of the orchard adjoining the road must almost certainly be better drained than the rest of the orchard, on account of its higher level above the road, and since in no other part of the orchard can any regular relation be traced between the rates of fermentation in adjacent trees of the same row and variety, the conclusion that the better drainage is responsible for the faster rate of fermentation in the end trees is strongly suggested. In other words, it appears that the amount of moisture retained in the soil, or the corresponding physical characters of the latter, may have much to do with the determination of the rate of fermentation. Since ciders which ferment slowly tend to be more full-bodied and of superior quality to those which ferment quickly, it will be seen

that the results of the investigations on the trees in the Young Orchard correspond with those arrived at in the soil investigations above described. They correspond also with the practical experience of cider-makers, since it is universally agreed that the cider made from fruit grown on heavy land is superior in quality to that from fruit off a light soil. It must, however, be left to the work in future seasons to decide whether this correlation in the results of this season's work is purely chance, or whether the nature of the moisture-retaining properties of the soil is, as is so strongly suggested at the outset of the investigations, really the important factor.

The thanks of the Institute are due to Professor S. H. Reynolds, and Messrs. C. T. Gimingham, C. J. Waterfall, and T. O'Brien, for their co-operation in connection with this work.

The Nature of the Intermediate Stock.—This subject was dealt with in last season's Report; and the analyses of the juices of Dabinett apples grown on different intermediate stocks in the Young Orchard at the Institute were given for the season 1908. All the trees fruited in 1909, and the analyses for that year are given in the appended table, with those of the previous season for comparison.

Comparing the figures given in the following table, it is evident that there is no very close agreement in the results, as a whole, for the two years, even allowing for the influence of the season. While Peasgood's Nonsuch and Newton Wonder (Tree 2) gave the lowest gravities in 1908, and very nearly the lowest in 1909, Annie Elizabeth (Tree 2), the next lowest in 1908, is one of the highest in 1909. Similarly, while Broadleaf Jersey and Newton Wonder (Tree 1) were respectively second and third in point of gravity in 1908, Warner's King (Tree 2), the first in 1908, is one of the lower half in 1909. Similar comparisons may also be made in respect of the malic acid and tannin contents. Certain of the trees, therefore, showed a tendency to produce relatively corresponding results in the two years; but others gave altogether different results. The comparatively close agreement of all the Morgan Sweet trees in all features except the rate of fermentation of the juice, both in 1908 and 1909, is interesting to note, and might be used to support the view that the intermediate stock has an influence upon the quality of the fruit: but the differences in the Newton Wonder results, and in other cases where there are duplicate trees, in that event require explanation. Thus, while there are some features which point to a definite influence of the intermediate stock, further light upon the subject is required before any definite conclusions

The Composition of Dabinett Juices from Different Intermediate Stocks.

Variety of Intermediate Stock.		Composition of Juice, 1908.			Composition of Juice, 1909.			
		Specific Gravity.	Malic Acid, per cent.	Tannin, per cent.	Specific Gravity.	Malic Acid, per cent.	Tannin, per cent.	Daily fall in Specific Gravity at 27 deg. C.
Annie Elizabeth	Tree 1 ..	—	—	—	1.056	.22	.136	9
Do.	Tree 2 ..	1.0565	.20	.268	1.057	.22	.212	12
Blenheim Orange	Tree 1 ..	1.057	.24	.374	1.055	.21	.240	10.2
Do.	Tree 2 ..	1.0625	.15	.364	1.057	.19	.204	—
Bramley's Seedling	Tree 1 ..	1.0665	.17	.382	1.049	.19	.256	9.2
Do.	Tree 2 ..	1.062	.26	.324	1.053	.22	.182	12
Broadleaf Jersey	.. ..	1.075	.12	.308	1.057	.20	.196	11.7
Broadleaf Norman	.. ..	1.062	.24	.364	1.052	.25	.176	10.2
Court Royal ..	.. ..	1.059	.18	.364	1.053	.24	.260	10.2
Ecklinville	Tree 1 ..	1.0645	.19	.332	1.052	.23	.164	12
Do.	Tree 2 ..	1.065	.17	.282	1.056	.23	.210	10.7
Hardwicke ..	.. ..	1.064	.24	.356	1.050	.20	.138	10.2
Hollow Core ..	.. ..	1.064	.23	.304	1.054	.23	.188	9.5
King of the Pippins	.. ..	1.064	.20	.290	1.055	.21	.176	13
Morgan Sweet	Tree 1 ..	1.064	.19	.414	1.056	.21	.212	6
Do.	Tree 2 ..	1.0655	.18	.374	1.057	.21	.180	7
Do.	Tree 3 ..	1.0625	.25	.348	1.058	.22	.156	7
Do.	Tree 4 ..	1.063	.19	.420	1.056	.20	.176	10.7
Do.	Tree 5 ..	1.060	.16	.334	1.055	.22	.180	11.2
Do.	Tree 6 ..	—	—	—	1.050	.22	.180	17.5
Newton Wonder ..	Tree 1 ..	1.073	.18	.384	1.057	.21	.212	9.7
Do.	Tree 2 ..	1.0535	.26	.274	1.050	.20	.196	8
Do.	Tree 3 ..	1.0665	.21	.344	1.050	.21	.144	8.7
Do.	Tree 4 ..	—	—	—	1.051	.21	.160	9.2
Peasgood's Nonsuch	.. ..	1.049	.21	.208	1.050	.24	.152	13
Sweet Alford ..	.. ..	1.065	.30	.346	1.054	.24	.096	12.5
Warner's King	Tree 1 ..	1.065	.18	.290	1.052	.22	.152	9.5
Do.	Tree 2 ..	1.0785	.22	.374	1.053	.22	.182	11.2
Grafted on Paradise Stock ..		—	—	—	1.055	.18	.144	11

can be formed. Fresh experiments have recently been started, and additional results for other varieties may be found in the table given in the following section.

The Culture of the Trees in Grass and Cultivated Ground.—An account of the experiments in progress in the Young Orchard on the influence of grass upon the standard cider and perry trees was given in the Report for 1908, and it was shown there that the results obtained up to that time went to prove that grass acted prejudicially on the growth of the tree, thus confirming the results of the Woburn experiments on grass influence. In connection with the latter it was observed that the quality of the fruit was also affected. It is thus a matter of importance to cider makers to determine exactly what effect, if any, the grass has upon the vintage quality of the fruit and upon the resulting cider. Until 1909 very little fruit was produced by the trees in the Young Orchard, but last season many of the trees bore fair crops, so that it was possible to make a comparison of the quality of the fruit. In the following table are given statistics of the composition and character of the juices obtained from the fruit of the respective trees, together with the treatment of each tree as regards grassing. The corresponding results for previous seasons, in cases where fruit has been produced, are also given. In addition are included similar statistics from fruit of the same varieties produced by bush trees worked on the Paradise stock and grown in cultivated ground in an adjoining plantation at the Institute, there being in these cases no possible influence from the proximity of grass.

The figures given in this table evidently afford no obvious indication of the influence of grass upon the vintage quality of the fruit, since there appears to be no uniformity in the results for any of the characters dealt with, even in the control cases where two or more trees of the same variety are treated in the same way. The irregularity is very well illustrated by the 3rd and 10th trees of Broadleaf Norman. Both of these are in grass : but while the juice from the former shows the highest specific gravity and the highest rate of fermentation, and contains more tannin and, with one exception, more malic acid than any other in the series, that from the latter has the lowest specific gravity and the slowest rate of fermentation, and contains less malic acid and, with one exception, less tannin than any other. Whatever may be the actual influence of the grass, it certainly appears to have been obscured thus far by the action of other factors. A comparison of the analytical results with the rates of growth of the respective trees has proved as yet of no assistance in explaining the irregularities. Probably local

variations in the character of the soil may be held accountable to a considerable extent. It has already been shown in the section on soil influence that the rates of fermentation of the juices from the trees along one side of the orchard appear to indicate the character of the soil in that region is largely responsible for the results in those cases. Another feature which indicates influence from local soil variation is the manner in which consecutive trees of a variety tend to yield results, for one or more characters, which correspond more closely than those from the other trees of the same kind, in spite of the fact that as a rule consecutive trees vary in their treatment as regards grassing. Thus the general tendency of the acidity figures for the Broadleaf Norman trees is in the direction of a fall from Tree 1 to Tree 10. Again, in the case of Trees 4, 5, and 6, of Cowarne Red the acidity stands markedly higher than in the case of the other trees. The rates of fermentation of the Medaille d'Or and Skyrme's Kernel juices and the specific gravities of the Strawberry Norman and Eggleton Styre juices also serve as illustrations.

Another feature which is more or less well-marked for most varieties is the general correspondence between the acidities and the rates of fermentation of the juices. Many exceptions are to be found in the tables; but, taking the results as a whole, it may certainly be claimed that there are indications of a relationship between the acidity and the rate of fermentation. It is curious, however, to notice that while for most varieties relatively low acidity is accompanied by a relatively low rate of fermentation—good examples being Chisel Jersey and Cherry Norman—in a few instances the opposite relation appears to obtain, the relatively low acidities in Court Royal and Cap of Liberty, for example, being associated with relatively high rates of fermentation. The precise significance to be attached to this relation cannot be settled until the results for a series of years are available. It may prove to be that the characteristics of the individual trees directly determine it, or it may be solely due to the state of ripeness of the fruit. It has long been known that as the ripeness of the fruit advances there is a diminution in its acidity; and it has been pointed out in previous Reports of the Institute that there is a relation between the state of ripeness of the fruit and the rate of fermentation of the juice. Thus the correspondence between acidity and rate of fermentation in the accompanying table may be nothing more than an expression of the varying condition of ripeness of the fruit from the different trees of a variety at the time of its examination; and it must be admitted that the results could quite satisfactorily be accounted for in this way. Notwithstanding the fact that every precaution was taken to

examine the fruit from each tree of a variety under as nearly as possible equal conditions—the different lots were gathered on the same day, stored together, and later analysed on the same day—it cannot be claimed that each lot at the time of analysis was exactly equally ripe. The total available quantity of fruit from each tree was not large, and the position of individual apples on the tree in relation to the sun undoubtedly affected not merely the chemical composition of the juice, but also its stage of ripeness. At the same time the possibility of the influence of the individual tree itself must not be overlooked. It is the rule in every section of the animal and plant kingdoms for individual members of the same species to vary somewhat in character; and in the case of fruits such as the apple, the trees of which are propagated vegetatively by means of buds and grafts, it is important to determine to what extent individual trees of the same variety can vary, and to ascertain how far the distinguishing characteristics of the parent tree can be transmitted to those propagated from it by means of buds or grafts.

It is hoped that some light may be thrown upon this factor of the "individuality" of the tree by these annual analyses of the produce of these trees in the Young Orchard. In a few cases the statistics for the last three years are available, but they are not sufficient to enable any conclusions to be drawn. Those given for the Medaille d'Or variety are the most complete; but thus far they fail to indicate any very well-marked individual characteristics.

In certain cases where the varieties have been head-grafted on different intermediate stocks, the question of the influence of the latter will eventually have to be considered in addition to the grassing influence. The results will serve also as a check on those obtained with the Dabinett trees, referred to in the preceding section. At present they offer no features of special interest beyond those to which attention has already been called.

The figures which are given for the trees on the Paradise stock are of interest not merely in connection with the question of grassing influence, but also in comparison with those for the same varieties on the free or crab stock. The question of root-stock influence is one about which little is known in its vintage aspect, and the few statistics here quoted hardly show any sufficiently strongly marked characteristics to afford any idea of its importance. It may be noted, however, that there seems to be a tendency to show low tannin results and high rates of fermentation. Since, however, the soil on which these trees are grown differs somewhat from that of the Young Orchard, allowance must be made for that factor.

Name of Variety.	Number of Tree.	Year.	Specific Gravity of Juice.	Percentage Composition of Juice.		Daily Fall in Specific Gravity at 27 deg.C.	Method of Treatment of Tree.
				Malic Acid.	Tannin.		
Black Foxwhelp	1	1909	1·052	·19	·156	—	Grass removed within radius of 4ft. 6in.
Ditto	2	1909	1·050	·19	·204	—	Ditto 3ft. ditto.
Ditto	4	1909	1·040	·18	·240	—	Ditto 4ft. 6in. ditto.
Broadleaf Jersey	1	1909	1·054	·32	·304	11·8	Ditto 4ft. 6in. ditto.
Ditto	2	1909	1·055	·33	·402	—	Ditto 3ft. ditto.
Ditto	4	1909	1.046	·38	·240	10·5	Ditto 4ft. 6in. ditto.
Ditto	5	1909	1·048	·35	·312	11·9	Ditto 3ft. ditto.
Broadleaf Norman	1	1909	1·047	·27	·152	9·0	Ditto 4ft. 6in. ditto.
Ditto	2	1909	1·046	·23	·148	8·2	Ditto 3ft. ditto.
Ditto	3	1909	1·051	·26	·196	9·8	Grass allowed to grow to base of tree.
Ditto.	4	1909	1·044	·25	·146	8·0	Grass removed within radius of 4ft. 6in.
Ditto	5	1909	1·045	·23	·128	7·0	Ditto 3ft. ditto.
Ditto	6	1909	1·048	·23	·132	8·0	Ditto 4ft. 6in. ditto.
Ditto	7	1909	1·046	·22	·172	7·5	Ditto 4ft. 6in. ditto.
Ditto	8	1909	1.045	·22	·156	9·2	Ditto 3ft. ditto.
Ditto	10	1909	1·043	·21	·132	6·5	Grass allowed to grow to base of tree.
Cap of Liberty (head-grafted on Morgan Sweet stock in 1906)	2	1909	1·052	·62	·096	10·5	Grass removed within radius of 3ft.
Ditto	3	1909	1.049	1·00	·132	8·5	Grass allowed to grow to base of tree.
Ditto	5	1909	1·049	1·03	·168	7·2	Grass removed within radius of 3ft.
Cap of Liberty (head-grafted on King of Pippins stock in 1906)	1	1909	1·044	1·08	·146	8·5	Ditto 4ft. 6in. ditto.
		1908	1·063	·76	·210	—	
Ditto	2	1909	1·045	1·04	·214	—	Ditto 3ft. ditto.
		1908	1.060	·80	·252	—	
Ditto	3	1909	1·048	·89	·070	10·5	Grass allowed to grow to base of tree.
Ditto	4	1908	1·068	·92	·198	—	Grass removed within radius of 4ft. 6in.
Ditto	5	1909	1·048	·89	·100	10·5	Ditto 3ft. ditto.
		1908	1·061	·78	·208	—	

Cap of Liberty (head-grafted on Broadleaf Jersey stock in 1906	1	1909	1·046	·83	·184	—	Ditto 4ft. 6in. ditto.
Cap of Liberty (grafted on Paradise stock)	—	1909	1·040	·49	·108	—	In cultivated ground.
Cherry Norman	1	1909	1·047	·14	·124	4·2	Grass removed within radius of 4ft. 6in.
Ditto	2	1909	1·050	·16	·170	9·7	Ditto 3ft. ditto.
Ditto	3	1909	1·047	·16	·158	9·5	Grass allowed to grow to base of tree.
Ditto	4	1909	1·052	·22	·348	—	Grass removed within radius of 6ft. 6in.
Ditto	5	1909	1·047	·25	·276	—	Ditto 3ft. ditto.
Ditto	6	1909	1·048	·15	·084	6·7	Ditto 4ft. 6in. ditto.
Ditto	7	1909	1·040	·26	·176	—	Ditto 4ft. 6in. ditto.
Ditto	8	1909	1·049	·19	·166	10·5	Ditto 3ft. ditto.
Ditto	9	1909	1·046	·25	·258	—	Ditto 3ft. ditto.
Chisel Jersey	1	1909	1·059	·36	·386	—	Ditto 4ft. 6in. ditto.
		1908	1·056	·18	·382	—	
Ditto	2	1909	1·053	·37	·190	6·0	Ditto 3ft. ditto.
		1908	1·066	·18	·454	—	
		1907	1·070	·24	·412	—	
Ditto	3	1909	1·052	·24	·126	3·8	Grass allowed to grow to base of tree.
		1908	1·070	·27	·540	—	
		1907	1·066	·23	·544	—	
Ditto	4	1909	1·054	·29	·084	5·5	Grass removed within radius of 4ft. 6in.
		1908	1·063	·28	·384	—	
Ditto	5	1909	1·054	·26	·166	5·2	Ditto 3ft. ditto.
		1908	1·056	·23	·420	—	
Court Royal	1	1909	1·046	·31	·094	8·8	Ditto 4ft. 6in. ditto.
Ditto	2	1909	1·046	·30	·106	10·8	Ditto 3ft. ditto.
Ditto	3	1909	1·051	·32	·112	8·2	Grass allowed to grow to base of tree.
Ditto	4	1909	1·057	·29	·156	—	Grass removed within radius of 4ft. 6in.
Ditto	5	1909	1·046	·29	·092	9·8	Ditto 3ft. ditto.
Ditto (Grafted on Paradise stock) ..	—	1909	1·054	·29	·090	—	In cultivated ground.
Cowarne Red	1	1909	1·045	·60	·090	11·7	Grass removed within radius of 4ft. 6in.
		1907	1·055	·54	·270	—	
Ditto	2	1909	1·045	·59	·090	9·7	Ditto 3ft. ditto.
		1907	1·045	·60	·170	—	
Ditto	4	1909	1·049	·80	·152	—	Ditto 4ft. 6in. ditto.
Ditto	5	1909	1·047	·82	·148	—	Ditto 3ft. ditto.

Name of Variety.	Number of Tree.	Year.	Specific Gravity of Juice.	Percentage Composition of Juice.		Daily Fall in Specific Gravity at 27 deg.C.	Method of Treatment of Tree.
				Malic Acid.	Tannin.		
Cowarne Red—continued	6	1909	1·050	·87	·144	—	Ditto 4ft. 6in. ditto.
Ditto	7	1909	1·040	·54	·118	9·3	
Ditto	9	1909	1·044	·73	·122	9·7	
Ditto	10	1909	1·037	·57	·138	7·3	
Cremière (head-grafted on Morgan Sweet stock in 1905)	—	1909	1·046	·24	·136	11·2	Ditto 4ft. 6in. ditto.
Ditto (head-grafted on Warner's King stock in 1905)	—	1909	1·045	·26	·144	11·0	Ditto 4ft. 6in. ditto.
Ditto (grafted on Paradise stock) ..	—	1909	1·056	·36	·116	—	In cultivated ground.
Dymock Red	1	1909	1·050	·36	·060	9·0	Grass removed within radius of 4ft. 6in.
Ditto	2	1909	1·050	·37	·052	9·5	Ditto 3ft. ditto.
Ditto	4	1909	1·059	·44	·086	10·5	Ditto 4ft. 6in. ditto.
Doux Amer (head-grafted on Broadleaf Jersey stock in 1905)	—	1909	1·047	·45	·070	8·6	Ditto 4ft. 6in. ditto.
Ditto (grafted on Paradise stock) ..	—	1909	1·042	·11	·090	—	In cultivated ground.
Ecarlatine (head-grafted on Warner's King stock in 1905)	1	1909	1·046	·23	·054	10·0	Grass removed within radius of 3ft.
Ditto (grafted on Paradise stock) ..	—	1909	1·055	·37	·120	13·3	In cultivated ground.
Eggleton Styre	1	1909	1·074	·35	·120	13·0	Grass removed within radius of 4ft. 6in.
Ditto	2	1909	1·060	·36	·116	11·8	Ditto 3ft. ditto.
Ditto	3	1909	1·061	·35	·106	11·8	Grass allowed to grow to base of tree.
Ditto	4	1909	1·057	·36	·156	—	Grass removed within radius of 4ft. 6in.
Ditto	5	1909	1·050	·33	·108	—	Ditto 3ft. ditto.
		1908	1·056	·28	·158	—	
Ditto	6	1909	1·057	·35	·116	11·0	Ditto 4ft. 6in. ditto.
Ditto	7	1909	1·054	·30	·116	8·5	Ditto 4ft. 6in. ditto.
		1908	1·060	·25	·156	—	
Ditto	8	1909	1·055	·30	·100	10·2	Ditto 3ft. ditto.

Eggleton Styre	9	1909	1·057	·31	·096	11·0	Ditto 3ft. ditto.
		1908	1·065	·28	·196	—	
Ditto	10	1909	1·052	·28	·132	—	Grass allowed to grow to base of tree.
Ditto (grafted on Paradise stock) ..	—	1909	1·052	·27	·120	—	In cultivated ground.
Kingston Black	1	1909	1·047	·47	·054	5·0	Grass removed within 4ft. 6in. radius.
		1908	1·069	·41	·302		
Ditto	2	1909	1·042	·53	·074	7·5	Ditto 3ft. ditto.
		1908	1·080	·59	·372	—	
Ditto	3	1909	1·047	·53	·060	10·5	Grass allowed to grow to base of tree.
Ditto	5	1909	1·049	·50	·086	11·5	Grass removed within radius of 3ft.
Knotted Kernel	1	1909	1·051	·32	·226	9·5	Ditto 4ft. 6in. ditto.
Ditto	2	1909	1·051	·25	·190	9·5	Ditto 3ft. ditto.
Ditto	3	1909	1·048	·24	·226	9·5	Grass allowed to grow to base of tree.
Ditto	4	1909	1·047	·15	·204	7·8	Grass removed within radius of 4ft. 6in.
Ditto	5	1909	1·052	·18	·196	9·8	Ditto 3ft. ditto.
Ditto	6	1909	1·052	·18	·176	7·5	Ditto 4ft. 6in. ditto.
Ditto	7	1909	1·053	·16	·128	9·2	Ditto 4ft. 6in. ditto.
		1907	1·065	·16	·272	—	
Ditto	8	1909	1·049	·17	·200	8·8	Ditto 3ft. ditto.
		1907	—	·23	·108	—	
Ditto	9	1909	1·050	·17	·236	10·0	Ditto 3ft. ditto.
Ditto	10	1909	1·056	·16	·220	—	Grass allowed to grow to base of tree.
Master's Jersey (head-grafted on Warner's King stock in 1906) ..	1	1909	1·058	·26	·202	9·0	Grass removed within radius of 4ft. 6in.
Ditto	2	1909	1·066	·37	·350	—	Ditto 3ft. ditto.
Ditto	3	1909	1·061	·33	·322	5·2	Grass allowed to grow to base of tree.
Ditto	5	1909	1·059	·36	·168	5·3	Grass removed within radius of 3ft.
Ditto (grafted on Paradise stock)	—	1909	1·052	·56	·100	—	In cultivated ground.
Medaille d'Or	1	1909	1·062	·33	·464	12·8	Grass removed within radius of 4ft. 6in.
		1908	1·076	·31	·940	—	
		1907	1·055	·31	·430	—	
Ditto	2	1909	1·061	·32	·568	14·2	Ditto 3ft. ditto.
		1908	1·070	·29	·664	—	
		1907	1·060	·32	·420	—	
Ditto	3	1909	1·059	·33	·412	12·5	Grass allowed to grow to base of tree.
		1908	1·076	·26	·564	—	

Name of Variety.	Number of Tree.	Year.	Specific Gravity of Juice.	Percentage Composition of Juice.		Daily Fall in Specific Gravity at 27 deg.C.	Method of Treatment of Tree.
				Malic Acid.	Tannin.		
Medaille d'Or—continued	4	1909	1·065	·34	·696	12·8	Grass removed within radius of 4ft. 6in.
		1908	1·072	·32	·864	—	
		1907	1·056	·25	·370	—	
Ditto	5	1909	1·053	·31	·368	10·5	Ditto 3ft. ditto.
		1907	1·059	·25	·410	—	
Ditto	6	1909	1·060	·32	·460	11·2	Ditto 4ft. 6in. ditto.
		1908	1·069	·28	·566	—	
		1907	1·061	·28	·430	—	
Ditto	7	1909	1·058	·33	·464	11·5	Ditto 4ft. 6in. ditto.
		1908	1·071	·27	·730	—	
		1907	1·068	·27	·400	—	
Ditto	8	1909	1·060	·29	·360	9·2	Ditto 3ft. ditto.
		1907	1·056	·22	·300	—	
Ditto	9	1909	1·062	·32	·508	11·0	Ditto 3ft. ditto.
		1908	1·081	·36	·392	—	
		1907	1·062	·28	·314	—	
Ditto	10	1909	1·058	·29	·440	10·5	Grass allowed to grow to base of tree.
		1907	1·059	·27	·310	—	
Ditto (grafted on Paradise stock) ..	—	1909	1·052	·28	·282	12·5	In cultivated ground.
M. Jacques (head-grafted on Morgan Sweet stock in 1905)	1	1909	1·055	·34	·488	—	Grass removed within radius of 4ft. 6in.
Ditto	2	1909	1·054	·37	·456	10·0	Ditto 3ft. ditto.
Reinette Obry (head-grafted on Morgan Sweet stock in 1905)	1	1909	1·050	·64	·150	12·2	Ditto 4ft. 6in. ditto.
		1908	1·058	·86	·154	—	
Ditto	2	1909	1·043	·62	·100	11·0	Ditto 3ft. ditto.
Ditto	3	1909	1·048	·67	·120	12·0	Grass allowed to grow to base of tree.
		1908	1·058	·80	·136	—	
Ditto (grafted on Paradise stock) ..	—	1909	1·051	·43	·072	13·0	In cultivated ground.

Rouge de Treves (head-grafted on Warner's King stock in 1905)	—	1909	1·041	1·11	·148	—	Grass removed within radius of 3ft.
Ditto (head-grafted on Hardwicke stock in 1905)	—	1909	1·048	·81	·152	—	Ditto 4ft. 6in. ditto.
Strawberry Norman	1	1909	1·054	·43	·320	8·4	Ditto 4ft. 6in. ditto.
Ditto	3	1909	1·054	·40	·340	8·6	Grass allowed to grow to base of tree.
Ditto	4	1909	1·050	·39	·268	8·0	Grass removed within radius of 4ft. 6in.
Ditto	6	1909	1·052	·38	·254	9·4	Ditto 4ft. 6in. ditto.
Ditto	7	1909	1·054	·35	·270	9·6	Ditto 4ft. 6in. ditto.
Ditto	8	1909	1·054	·34	·262	8·5	Ditto 3ft. ditto.
Ditto	9	1909	1·067	·49	·366	—	Ditto 3ft. ditto.
Ditto	10	1909	1·066	·45	·360	—	Grass allowed to grow to base of tree.
Ditto (grafted on Paradise stock) ..	—	1909	1·050	·37	·230	12·5	In cultivated ground.
Skyrme's Kernel	1	1909	1·047	·78	·244	11·0	Grass removed within radius of 4ft. 6in.
		1908	1·060	·57	·228	—	
		1907	1·058	·71	·270	—	
Ditto	2	1909	1·048	·69	·184	9·5	Ditto 3ft. ditto.
		1908	1·059	·54	·198	—	
		1907	1·058	·74	·250	—	
Ditto	3	1909	1·047	·65	·164	9·9	Grass allowed to grow to base of tree.
		1907	1·054	·68	·244	—	
Ditto	4	1909	1·045	·67	·188	9·0	Grass removed within radius of 4ft. 6in.
		1907	1·051	·62	·222	—	
Ditto	5	1909	1·049	·68	·128	—	Ditto 3ft. ditto.
Ditto	6	1909	1·046	·66	·184	8·5	Ditto 4ft. 6in. ditto.
Ditto	7	1909	1·055	·49	·170	12·0	Ditto 4ft. 6in. ditto.
Ditto	8	1909	1·051	·54	·192	12·5	Ditto 3ft. ditto.
Ditto	9	1909	1·048	·50	·192	10·5	Ditto 3ft. ditto.
Ditto	10	1909	1·048	·58	·200	10·0	Grass allowed to grow to base of tree.
Ditto (grafted on Paradise stock)	—	1909	1·052	·40	·116	—	In cultivated ground.
Sweet Alford (head-grafted on King of Pippins stock in 1906)	3	1909	1·052	·19	·090	—	Grass allowed to grow to base of tree.
Ditto.	4	1909	1·044	·15	·060	—	Grass removed within radius of 4ft. 6in.
Ditto	5	1909	1·042	·18	·044	—	Ditto 3ft. ditto.
Ditto (head-grafted on Ecklinville stock in 1906)	1	1909	1·052	·16	·044	—	Ditto 4ft. 6in. ditto.

Name of Variety.	Number of Tree.	Year.	Specific Gravity of Juice.	Percentage Composition of Juice.		Daily Fall in Specific Gravity at 27 deg.C.	Method of Treatment of Tree.
				Malic Acid.	Tannin.		
Sweet Alford—continued	2	1909	1·046	·16	·032	—	Ditto 3ft. ditto.
Ditto	4	1909	1·043	·18	·052	—	Ditto 4ft. 6in. ditto.
Ditto	5	1909	1·041	·17	·048	—	Ditto 3ft. ditto.
Ditto (head-grafted on Broadleaf Jersey in 1906)	—	1909	1·051	·17	·060	—	Ditto 3ft. ditto.
PEARS.—							
Moorcroft	1	1909	1·033	·14	·036	7·0	Grass removed within radius of 4ft. 6in.
Ditto	2	1909	1·036	·14	·036	8·5	Ditto 3ft. ditto.
Ditto	3	1909	1·036	·24	·026	8·2	Grass allowed to grow to base of tree.
Ditto	4	1909	1·034	·18	·029	6·5	Grass removed within radius of 4ft. 6in.
Ditto	5	1909	1·034	·19	·032	8·2	Ditto 3ft. ditto.
Oldfield	1	1909	1·049	·37	·100	8·2	Ditto 4ft. 6in. ditto.
		1907	1·051	·34	·056	—	
Ditto	2	1909	1·053	·36	·104	10·0	Ditto 3ft. ditto.
Ditto	3	1909	1·051	·33	·062	—	Grass allowed to grow to base of tree.
		1907	1·062	·36	·150	—	
Ditto	4	1909	1·048	·34	·116	10·0	Grass removed within 4ft. 6in. radius.
		1907	1·050	·37	·110	—	
Ditto	5	1909	1·049	·37	·118	12·0	Ditto 3ft. ditto.
		1907	1·052	·36	·100	—	
Taynton Squash	1	1909	1·040	·11	·014	3·7	Ditto 4ft. 6in. ditto.
Ditto	2	1909	1·031	·10	·160	2·5	Ditto 3ft. ditto.
Ditto	3	1909	1·032	·12	·024	2·7	Grass allowed to grow to base of tree.

The Character of the Season.—The variations in the quality of vintage fruit from the same trees in different years, owing to purely seasonal influences, are familiar to every cider-maker. It is inevitable that the nature of the season should exert a very considerable influence upon the character of the cider on account of the important part played by sunshine and other weather conditions in connection with the ripening of the fruit. The subject was dealt with each year by Mr. F. J. Lloyd, in his series of Reports in the Bath and West Journal on the experimental cider work carried on at Butleigh; and the influence of the characteristic features of each season was then discussed. Renewed attention to the matter has been called by the abnormal character of the 1909 weather. Although the seasonal influence is beyond the control of the cider-maker, it is possible that means might be found to minimise the effects of an unfavourable season; and even if none are discovered, any information likely to lead to the utilisation to advantage of the material at command is of value. A study of the influence of weather conditions has been in progress at the Institute for some time; and, although only a few conclusions of a definite character have yet been established, reference is here made to the subject, partly on account of numerous enquiries which have been received, and partly in the hope that those interested in the subject may be led to place their own experience at the disposal of the Institute. Any information forthcoming will be welcomed.

There is little doubt that the richness in saccharine matter and the acidity of the fruit are closely connected with the amount of sunshine during the ripening period. The same factor is also of great influence in determining the rate of fermentation. How far the tannin and allied constituents are affected by sunshine has not yet been decided; but the results of the analyses of the 1909 crop show that the percentage of these substances has this season been abnormally low. The keeping qualities of the fruit have also been bad; and it is possible that the reduction of tannin so much below the normal may be largely, if not entirely, responsible for this effect. It is probable that sunshine has a particularly beneficial influence upon the quality of the fruit at certain critical periods during its ripening; but very little definite information on this point has yet been obtained. It is, however, certain that varieties which ripen at different periods do not receive the same amount of benefit from a spell of sunshine.

The amount of rainfall is also a factor of importance, its chief influence probably being upon the saccharine constituents of the fruit. Generally a wet season is characterised by juices of low

specific gravity. But although the juices appear to be weakened in strength, as it were, as regards sugar, and possibly also tannin, the dilution does not necessarily apply to the acidity. In fact, in wet seasons the tendency is for the acidity to be above the average ; but this result is, perhaps, owing mainly to the deficiency of sunshine which usually accompanies a wet season.

The average temperature and the amount of wind are probably also factors of appreciable influence ; but too little is at present known of their effect to allow of any generalisations being made.

To illustrate the degree to which the composition of the juice may be affected by seasonal influences alone, a number of analyses which show the variation in quality are given in the appended table, the fruit in the case of each variety quoted being taken from the same tree every year. The only other factor, therefore, which need be taken into account, in addition to that of the weather, is that of the degree of ripeness of the fruit at the time of its analysis ; and that has been minimised as far as possible by dealing with fruit which may be described as thoroughly ripe. From this table it will be noticed that none of the features which show variation are affected equally or, necessarily, in quite the same direction by any one season ; and even different trees of the same variety may exhibit somewhat different results in this respect.

Name of Variety.	Year.	Specific Gravity.	Malic Acid, per cent.	Tannin, per cent.
Kingston Black	1904	1.0535	.47	.178
	1906	1.064	.70	.164
	1908	1.062	.76	.272
	1909	1.048	.60	.148
Chisel Jersey, Tree 2	1907	1.070	.24	.412
	1908	1.066	.18	.454
	1909	1.053	.37	.190
Chisel Jersey, Tree 3	1907	1.066	.23	.544
	1908	1.070	.27	.540
	1909	1.052	.24	.126
Skyrme's Kernel, Tree 1	1907	1.058	.71	.270
	1908	1.060	.57	.228
	1909	1.055	.49	.170
Skyrme's Kernel, Tree 2	1907	1.058	.74	.250
	1908	1.059	.54	.198
	1909	1.051	.54	.192
Butleigh No. XIV.	1904	1.089	.19	.306
	1906	1.0918	.20	.432
	1907	1.086	.16	.324
	1908	1.098	.10	.420
	1909	1.058	.34	.108

The Vintage Qualities of Market Varieties of Apples.

It is generally recognised by cider makers that for the production of the best types of cider what are commonly known as vintage varieties of apples are necessary; and it is at the same time usually maintained that the kinds of this fruit which come under the head of market varieties are of little value for cidermaking. From time to time, however, it has been advocated that more attention should be given to the use of market varieties for vintage purposes, on the grounds that a profitable means of utilising the small and unsaleable fruit would be available, and that in seasons of heavy crops a glut of fruit on the market could be avoided, and prices maintained. Recently so many enquiries from different parts of the country as to the use of market fruit for vintage purposes have been addressed to the Institute, that it has been considered desirable to make a more thorough investigation of the matter than had previously been done.

There is, strictly speaking, no single distinctive feature separating market from vintage varieties; and, in fact, in certain instances, such as the larger types of sharp apples, it is difficult to say whether it is more correct to regard the variety in question as belonging to the market or to the vintage section. There are undoubtedly cases where a variety is equally suited for both purposes, and there are frequently occasions when undisputed typical vintage kinds of the sweet and bitter-sweet classes can be sold very profitably for market purposes. However, there are certain more or less well-marked combinations of individual characters which can be used to define the two classes, if the reservation is made in the case of vintage varieties that only those varieties are included which possess to a reasonable extent the essential vintage characters. It is necessary to make this reservation, since nearly all the miscellaneous varieties found in the West of England cider orchards are commonly regarded as vintage kinds, whereas a very large number are merely "wildings" and possess little or no vintage merit.

As a rule market varieties may be distinguished from vintage kinds by the larger size of the fruit, the more delicate and less tough character of its skin, and the looser, more or less mealy, and less dense nature of its flesh, which is due doubtless to the presence of more numerous and larger intercellular spaces between the individual cells of its tissues. Its flavour also is more or less distinct, that of the former type being generally less sweet and more watery, sharper, and lacking in astringency as compared with that of the latter. These differences, as will presently be seen, are clearly expressed in the chemical composition of the juice.

During the past season a number of market varieties grown in the Institute plantations have been analysed, and small-scale tests have been made to ascertain the type of cider produced. The results of the analyses are given in the accompanying table.

Name of Variety.	Specific Gravity.	Percentage Composition of Juice.		Daily fall in Specific Gravity at 27°C.
		Malic Acid.	Tannin.	
Allington Pippin	1·047	·77	·042	14·0
American Mother	1·040	·41	·088	—
Bismarck	1·046	·56	·084	—
Blenheim Orange	1·051	·53	·054	12·8
Ditto A.	1·048	·65	·088	10·8
Bramley's Seedling..	1·045	·55	·084	11·0
Ditto A.	1·047	·87	·080	7·8
Charles Ross	1·042	·63	·062	14·0
Cox's Orange Pippin	1·059	·62	·060	18·7
Ditto A.	1·057	·60	·042	14·2
Ecklinville	1·034	·83	·042	7·2
Frogmore Prolific	1·042	·57	·052	12·3
James Grieve	1·036	·32	·024	—
King of the Pippins	1·041	·51	·026	11·7
Lady Sudeley	1·028	·32	·058	—
Lane's Prince Albert	1·045	·84	·092	10·0
Lord Derby	1·039	·27	·060	9·8
Newton Wonder	1·044	·65	·084	10·8
Ditto A.	1·045	·71	·072	10·8
Norfolk Beefing	1·050	·60	·090	7·4
Peasgood's Nonsuch	1·054	·77	·052	—
Potts' Seedling	1·026	·58	·028	7·7
Rival	1·046	·32	·084	16·0
Royal Jubilee	1·052	·38	·066	—
Stirling Castle	1·030	·64	·016	9·3
Wealthy	1·032	·67	·046	14·0
Wellington	1·043	·86	·060	14·3
Worcester Pearmain	1·040	·30	·092	—

All the samples examined were grown at the Institute with the exception of those marked A. These were grown by Mr. John Riley at Putley, Hereford.

A comparison of these results with those given in Appendix A obtained from typical vintage kinds such as Cap of Liberty, Kingston Black, Sweet Alford, Chisel Jersey, Medaille d'Or, and Royal Jersey, indicates very plainly the essential deficiencies of market varieties for vintage purposes. With few exceptions the specific gravity and, therefore, the richness in saccharine matter of the juice is low, even when due allowance is made for the lack of quality caused by the unsatisfactory season of 1909. The cider produced would thus be wanting in alcoholic strength, and for that reason would be especially prone to acetic fermentation. The acidity of the juice, on the other hand, is almost invariably high, so that

a cider produced exclusively from market fruit would tend to be, like a cider produced from sharp varieties of vintage apples alone, decidedly too sharp in flavour for the average palate. The deficiencies of market fruit are, however, still more strongly marked by the results for tannin and the rate of fermentation of the juice. In no case, it will be observed, does the amount of tannin reach .1 per cent. While the general tendency of recent years has been to favour a reduction in the amount of tannin previously considered necessary for a high-grade cider, it must, nevertheless, be admitted that at least .15 per cent. of that substance should be present in ordinary cases, and that any quantity below that limit results in the loss of body and possibly, also, of keeping qualities in the cider. The rate of fermentation is in every case excessively high for cider purposes ; and it would certainly be almost impossible to retain any natural sweetness in such ciders by means other than the use of preservatives. It is true that in nearly every case the fruit was taken from young trees, and that there is a probability that the rate of fermentation would be appreciably less for the produce of older trees, but even so the rate is unduly rapid. The average market variety under normal conditions may then be regarded as only capable of yielding a dry cider. The actual ciders made in these trials are hardly yet sufficiently matured to allow of anything very definite being stated as to their characters for flavour and aroma.

It is clear that the use of market fruit alone for cider-making in the usual way can only be extremely limited as regards the type of cider produced. The kind of beverage produced by ordinary methods will be a thin, dry cider, lacking in body and of marked acidity, probably possessing poor keeping qualities, and exceeding liable to acetification. This has proved to be the case in the few instances where tests on a practical scale have been made at the Institute in past seasons. These tests have, however, shown that it is practicable by suitable treatment to produce a palatable and marketable beverage even although it may not bear comparison with a cider made from true vintage fruit. There has been nothing in the flavour of these ciders to constitute any serious drawback, and indeed in one instance it was so good that a really delicate dry cider was produced by suitable blending.

There appear to be two directions in which satisfactory results may be expected. The first consists in the utilisation of a moderate quantity of true vintage fruit of the sweet and bitter-sweet types to blend with the market sorts. By mixing suitable proportions of

each type it is possible to obtain a juice of fair average richness in saccharine matter and of modified acidity and astringency. Such a blend can be allowed to ferment to dryness, and a very fair, dry cider may be produced. It may even be possible in special cases to retain some natural sweetness by filtration, if the vintage sorts selected possess very slowly fermenting juices. The other course of action which may be adopted is to increase the original amount of saccharine matter in the juice by the addition of sugar in such quantity that, when completely fermented, the liquor will contain sufficient alcohol to restrain acetification. Such cider can then be stored long enough, without deterioration, for the excessive natural acidity to be gradually toned down and mellowed until it is no longer too pronounced. It may then be consumed as dry cider, or, if preferred, sweetened shortly before use with a further addition of sugar. A product of this type cannot be compared with a high-class natural cider, but it may be none the less palatable, wholesome, and saleable.

In districts where considerable quantities of apples are grown for market it is certainly worth while to devote more attention to the question of cider-making than has been given in the past, and to develop this means of utilising profitably surplus fruit. It would, however, be a mistake to regard market varieties as capable of supplanting vintage varieties for the production of the choicest types of cider.

INVESTIGATIONS ON FRUIT CULTURE.

The Influence of Grass upon the Growth of Orchard Trees.

An account of the experiments upon the influence of grass upon the growth of orchard trees was given in the last Annual Report, and the results up to that date were included. It was shown that in a grass orchard the young trees around which the turf was removed and the soil cultivated for a radius of 4ft. 6in. and 3ft. respectively, made more rapid growth than those around which the grass was allowed to grow to the base of the tree ; and it was also established that the average percentage increase in girth was greater in cases where the cultivated area was 9 feet in diameter than where it was limited to 6 feet. During the past season similar records were again kept, and the results resemble those in previous years in that the detrimental influence of grass on the growth of the trees is still noticeable. The additional year's records are, however, of interest primarily because of information afforded in connection with certain features, which could not be gained from the earlier

results on account of the time during which the experiments had been in progress being too short. The principal object of these experiments has been not so much to demonstrate the injurious action of the grass as to determine whether it is profitable to keep the soil immediately around the trees free from grass; and, if so, to ascertain what area of cultivated soil is desirable, and how long the beneficial effect makes itself felt. The records of last season's growth appear to furnish this information, although it cannot be considered definitely established until confirmation is forthcoming.

In dealing with the records in this connection, only the eight varieties discussed in detail in last year's Report will be considered, for reasons given on that occasion. The accompanying table shows the average girth of the trees under the different methods of treatment for each year since 1906, when the first measurements were taken. The girth of each tree on that occasion has been taken as 100, and later measurements have been calculated to the same scale, so that the results for each tree represent percentage calculations, and may, therefore, be directly compared.

Name of Variety.	Treatment of Tree.	Average Girth.				
		March, 1906.	March, 1907.	March, 1908.	March, 1909.	March, 1910.
Broadleaf Norman.	Cultivated area 9ft. diam.	100	132.3	161.6	184	216.3
Do.	Do. 6ft.	100	124	146	165.5	207
Do.	Grass	100	123	142	168.5	179
Cherry Norman.	Cultivated area 9ft.	100	124.7	157.7	190	238.5
Do.	Do. 6ft.	100	119	148	177	229.6
Do.	Grass ..	100	115	141.5	165.5	210
Cowarne Red.	Cultivated area 9ft.	100	136.7	160.2	183.5	213.5
Do.	Do. 6ft.	100	130	153.5	177	227.5
Do.	Grass	100	122	140	159.5	205
Foxwhelp	Cultivated area 9ft.	100	133	168.5	195.5	229.5
Do.	Do. 6ft.	100	118.5	138.5	160	191.5
Do.	Grass	100	110	131	144	182
Knotted Kernel.	Cultivated area 9ft.	100	142.5	187.5	221.7	275.2
Do.	Do. 6ft.	100	139	171.7	204.2	244.2
Do.	Grass	100	128.5	162	187.5	224.5
Medaille d'Or.	Cultivated area 9ft.	100	135	167.2	190.2	233.2
Do.	Do. 6ft.	100	123.5	158.5	184.7	223.2
Do.	Grass	100	119.5	141.5	159.5	182
Skyrme's Kernel.	Cultivated area 9ft.	100	128	159	184	225
Do.	Do. 6ft.	100	127.3	149.6	170.6	208.6
Do.	Grass ..	100	128.5	146.5	164	202
Strawberry Norman.	Cultivated area 9ft.	100	140.2	183.2	210.7	256.7
Do.	Do. 6ft.	100	133	161.5	186.5	218
Do.	Grass	100	124.5	148	169.5	200
Average for all Varieties ..	Cultivated area 9ft.	100	136.6	168.1	194.9	236.1
	Do.	100	127.4	153.4	178.2	218.7
	Grass	100	121.4	144.6	164.7	198.1

It is impossible in the face of the unanimity of the results for each variety to doubt the injurious effect of grass on the growth of the tree, or to dispute the conclusion that the removal of the turf in grass orchards around each tree for so small an area as a circle of 6 ft. diameter has an appreciable influence for good on its development, and it is reasonable to assume, in view of the results with the 9 ft. areas, that the more extended the removal of the turf the better it is for the tree, at any rate for a few seasons.

An analysis of the figures shows that the amount of increase in girth varies appreciably from season to season, the growth during 1909 being considerably greater than in the previous seasons ; and this variation occurs in the same direction with each method of treatment. Taking the average for all varieties the point of most interest, however, is that, while growth has been greatest in the case of the trees in the 9ft. areas, the gain in these cases over those in the 6ft. areas was effected almost entirely in the first two seasons. In March, 1908, it had averaged 14.7 per tree, but it increased in March, 1909, and March, 1910, only to 16.7 and 17.4 respectively. In the first year to March, 1907, it was 9.2 per tree. Each season, therefore, the gain has become less, and during the last two years it has been so small as to be hardly worth consideration for practical purposes. Succeeding records will show if it is actually the case that the limit of advantage of the 9 ft. areas has, as appears probable, now been reached. Certainly for the past two seasons the increased development of the tree has been so slight as to render the extra labour required to keep the larger area free from grass unprofitable. A corresponding behaviour in comparison with the trees in grass has not, however, yet occurred. Each year there has been an appreciable gain by the trees in both the 9 ft. and 6 ft. areas over those in grass; and up to the present the annual gain has been well maintained, the actual figures being for the trees in the 6 feet areas in 1906, 6 points, in 1907, 8.8, in 1908, 13.5, and in 1909, 20.6. The removal of the grass for an area 6 ft. in diameter is, therefore, still proving profitable.

A point of importance in connection with the planting of new orchards arises naturally from these results. Instead of planting directly in grass land, as is customary, it seems likely that the better plan will prove to be to plant in cultivated land, which may afterwards be sown to grass, since apparently it is during the first season or two after planting that the tree reaps most benefit from the absence of grass in its proximity.

The Influence of the Age and Size of the Tree at the Time of Planting upon its Subsequent Development.

There has recently been some discussion as to the best age and size of standard trees for planting. In certain districts there is a strong prejudice in favour of planting large trees at least seven or eight years old from the time of grafting. While there are certain advantages in this system, such as the shorter period during which the tree requires to be fenced and protected and the less substantial nature of the fencing necessary, it is claimed by most authorities who have had experience of planting trees of all ages and sizes, that the results are decidedly inferior to those given by trees not older than four or five years at the time of planting. Experiments at Woburn also have shown that two-and three-year-old trees give better results, as estimated by the crop yield, than four-year-old trees. Although no special series of experiments at the Institute has been conducted with reference to this question, a considerable amount of information may be derived from the trees in the Young Orchard which have been used primarily to determine the influence of grassing. Unfortunately the size of these trees was not measured at the time of planting, and the first records of actual size are those taken in March, 1906, two years after the trees were planted. It is, however, reasonable to suppose that the trees of a variety which were appreciably smaller at that date than others of the same sort were smaller at the time of planting, since the annual measurements make it clear that the actual difference in size in such cases could not be due to differences in the rate of growth alone, the margin being too large. Consequently it may be assumed that in the average case the trees which were relatively small in March, 1906, are those which were the smallest at the time of planting in 1904; and even in exceptional cases where this might not have been so, that fact will not vitiate the conclusions to be drawn, since it will tell against rather than for them.

The trees ranged from three to seven or eight years old at the time of planting, the exact age in the latter instances being uncertain, since the pruning which had been done in the nursery before they were purchased was too hard to allow of its determination. Unfortunately, in nearly every instance all the trees of any one variety were of the same age, so that it is impossible to compare the effect of age on trees of the same sort; and some allowance, which cannot be expressed in any exact figures, should be made for the characteristic vigour of growth of the varieties under consideration in comparing the rate of increase for the respective varieties. In

spite of these difficulties, however, it can be claimed that the results indicate clearly the probability that the younger and the smaller the tree at the time of planting the better is the subsequent rate of growth, it being understood that no trees under the age of two or three years from the graft are referred to.

The following table gives the average actual girth in inches of the trees for each variety when the first measurements were taken in 1906, and the average girth taken at the end of the 1909 season, expressed, however, not as actual size in inches, but in the same terms as in the preceding section dealing with the influence of grass. In order to neutralise as far as possible the disturbing influence due to the grassing experiments, the trees under each form of treatment have been considered separately, and their results averaged; so that the actual figures given represent the mean calculated from the average for the trees in the 9 feet, 6 feet, and grass areas respectively, and may therefore be compared as being strictly equivalent. The only exception is in the case of the Dymock Red variety. In this instance no tree in grass was available, so the number given represents the mean only of the averages from the 9 feet and 6 feet cultivated areas respectively.

Name of Variety.	Actual Girth in inches, 1906.	Calculated Girth for Comparison.	
		1906.	1909.
Chisel Jersey	3.03	100	272.3
Cowarne Red	3.28	100	215.3
Dymock Red	3.34	100	280.5
Kingston Black	3.42	100	235.5
Skyrme's Kernel	3.58	100	211.9
Knotted Kernel	3.79	100	248
Cherry Norman	3.83	100	226
Broadleaf Norman ..	3.90	100	200.8
Strawberry Norman ..	4.05	100	224.9
Medaille d'Or	4.06	100	212.8
Eggleton Styre	4.54	100	229
Foxwhelp	4.67	100	201
Broadleaf Jersey	5.62	100	183.8
Court Royal	5.94	100	208.2

The varieties, whose names are given in italics in the above table, are those which, having suffered severely from damage by canker and other causes at the Institute, ought not to be taken strictly in account with the others, all of which are reasonably healthy and flourishing. Leaving them out of account, therefore, it is striking how regularly the varieties which averaged least in size originally

have made the best percentage growth, even when no allowance is made for the natural vigour of growth of the varieties in question. When it is considered that Court Royal, Broadleaf Jersey, Knotted Kernel and Eggleton Styre are the strongest, and Kingston Black and Cherry Norman the weakest growers in the nursery at the Institute, which is on similar soil to that of the Young Orchard, it is remarkable how closely the percentage increase in size is related to the original size of the stock.

With reference to the question of age, all of the trees were four-year-olds from the graft at the time of planting, except the Knotted Kernels, which were three-year-olds, and the Court Royals and Broadleaf Jerseys, which were seven or eight years old. The results, therefore, afford a strong presumption in favour of the view that it is better to plant young than old trees.

For decisive results it is, of course, necessary to deal with trees of the same variety; and in the present case the numbers of trees of each sort dealt with are so limited that definite conclusions are handicapped. In spite of this, however, in certain instances very striking results have been obtained, especially in the case of two trees of the Chisel Jersey and Kingston Black varieties. In the former case a tree, whose original girth was $2\frac{5}{8}$ inches, may now be represented by 331, while the remainder of that variety originally measuring from $3\frac{3}{8}$ to $3\frac{7}{16}$ inches, now may be represented by 240-244. In the latter case the girth of the tree in question was $2\frac{1}{2}$ inches, and of the remainder from $3\frac{5}{16}$ to $3\frac{7}{8}$ inches; their comparative girths are now 295 and from 219 to 234 respectively.

Further proof from specially conducted experiments is necessary before the question can be considered as settled; but taking the above results as far as they go, there is evidently a strong case to be made out in favour of young and comparatively small trees for planting.

Experiments on the Pruning of Apple and Pear Bushes.

In last season's Report, an account of the scheme of pruning experiments on apple and pear bush trees worked on the Paradise and Quince stocks respectively, was given. Since the plantation was only laid out in 1905, it is at present too soon to attempt to draw definite conclusions from the results of the experiments; but the 1908 crops, so far as they went, indicated very clearly the advantage of light over hard winter-pruning for obtaining quick cropping, while as regards growth the lightly pruned trees, in the case of practically every variety under trial, had developed sufficiently stoutly and

Crop Record for 1909 of Apple and Pear Bushes under Different Systems of Pruning.

Average Yield in lbs. per Bush.

Name of Variety.	Not shortened, thinned only. No summer or root pruning.	Slightly Shortened.				Severely Shortened.				At discretion.	
		No summer or root pruning.	Summer pruned.	Root pruned.	Summer pruned, and root pruned.	No summer or root pruning.	Summer pruned.	Root pruned.	Summer pruned and root pruned.	Not root pruned.	Root pruned
APPLES—(Dessert)											
Allington Pippin ..	20	25	24	21¾	20	¾	10	5½	6	14¾	17
Beauty of Bath ..	1½	2½	1½	3½	1½	1¾	1¼	¼	¾	1¾	1½
Cox's Orange Pippin ..	4½	4¾	16½	10½	5	2¼	1½	5¼	2¾	3½	8¼
Devonshire Quarrenden	5¾	8¼	8	2¼	¾	—	¼	1½	2	1¾	1½
King of the Pippins ..	21	13¾	3	15¼	4	1½	2¼	2½	1½	4	6¼
Worcester Pearmain ..	—	5¼	2	7¼	2¾	2¼	1¾	1	3½	3¼	4¾
(Culinary)											
Bramley's Seedling ..	5¼	5	—	9½	4¼	¼	¼	9	1½	1	2½
Ecklinville Seedling ..	6¼	16¼	17	11¾	4½	7¼	13½	8¼	10½	15¼	6¾
Lane's Prince Albert	10½	30	13½	15¼	4½	17¼	9¾	15½	2	5¼	4½
Lord Suffield	2¼	3½	2½	6¾	3¼	2	4	—	3¾	2½	¼
Newton Wonder ..	14	12¾	14	19¾	19½	4½	¾	24¼	7¼	5¾	8¾
Stirling Castle ..	22¼	19	20½	¼	2¾	3½	3¼	5	3½	12¼	4
PEARS—											
Catillac	4	—	¼	—	—	—	—	—	—	—	—
Doyenne Boussoch ..	19	4½	8½	3	4¼	¼	1	—	1¾	5¼	—
Louise Bonne de Jersey	19½	15⅛	22	11½	18	8½	10	9	6¼	7¾	9¼
Williams' Bon Chretien	—	8¾	2¼	—	4½	¼	1	3¾	3	3⅛	1½
Total	156	177¼	155½	137½	99¾	52¼	60½	90¾	56½	88½	77½

produced enough new wood for future requirements. The bushes which were root-pruned in 1907, two years after planting, gave in 1908 for most varieties appreciably larger crops than the non-root-pruned trees, but all suffered in growth from the root-pruning, and some varieties, particularly Lord Suffield, were very seriously weakened.

In 1909 nearly all the bushes produced fruit, and the crops in many instances were quite good. The table, on next page, gives the average weights of the crops per bush for each variety under treatment, according to the system of pruning adopted.

It will be observed from these figures that the superiority of light over severe winter-pruning for cropping purposes, which was observed in the 1908 crop, is very markedly shown also in that of 1909; and, as far as can be seen, the gain in crop has not been obtained at the expense of the future productiveness of the tree. In the case of many varieties the bushes in the lightly pruned sections have already practically filled their allotted space, so that little further increase in size is necessary. The manner in which such bushes are furnished with fruit spurs furnishes a striking contrast between them and those which have been severely pruned. Consequently there can be little doubt in the minds of those who have seen the individual trees that, for soils of the character of that at the Institute, and in plantations of mixed bush and standard trees, or of bush trees only at comparatively small distances apart, light winter pruning is likely to prove much more profitable than severe pruning.

The results for the two columns representing bushes pruned at discretion—except for the distinction of root-pruning—represent in the main the effects ofmoderate winter-pruning; but it is not fair to the system of pruning adopted for each variety—which varies, of course, according to the general character of growth and cropping qualities of the individual varieties dealt with—to lay much stress on the results thus far shown, since the special form of pruning selected has only recently been put in operation, the trees previously having been included either in the lightly or severely pruned section. It appears, however, that moderate pruning in this series of experiments will yield results intermediate in character between those for light and severe pruning.

In contradistinction to the results for light and severe pruning in 1908, it will be observed that the effects of root-pruning as illustrated by the 1909 crop are, as a whole, exactly opposite in character from those shown by the 1908 crop. In the latter instance the crops from the root-pruned bushes were decidedly heavier than

those from the non-root-pruned bushes; whereas, in the former instance, the results are reversed. It appears, therefore, that the beneficial effect of root-pruning in encouraging cropping has been temporary only: and the reason is obvious, when the root-pruned and non-root-pruned trees are compared. For most varieties, as stated last year, the production of the crop was at the expense of the current season's growth, and during the past season this check to growth has still been felt. While, therefore, the branches of the root-pruned bushes in many instances are rather better furnished with fruit spurs than equal lengths of those of non-root-pruned bushes, the actual size of the trees is so much smaller that the total number of fruit spurs per tree is also decidedly fewer. While this statement holds good for most varieties, there are some, such as Bramley's Seedling and Newton Wonder, which still show the benefit of root-pruning; and the variation in the results with different varieties thus far accords perfectly with the experience of fruit growers generally. The results in respect of root-pruning for the first two seasons after the operation may be summarised as follows: root-pruning produced an increase in crop in the season following the operation; the beneficial effect passed off entirely, or almost disappeared, in the following season in the case of the weaker growing varieties owing to the severe check to growth, and probably will eventually prove to the detriment of the trees; but it was still appreciable in the case of the stronger growing varieties, and may possibly still be felt for several seasons.

It is too early yet to generalise as to the respective merits of the various combinations of pruning which have been tested; but, certainly thus far, the results point to the conclusion that, except for very strong growing varieties, where root-pruning is probably desirable to force a crop, and for very weak growing varieties, where severe winter pruning may be required in the early stages to encourage good wood formation, the less the trees are pruned the better, when both growth and cropping qualities are considered. If this proves to be the case, it will confirm the results of pruning experiments carried on under quite different conditions at the Woburn Experimental Fruit Station.

Strawberry Runner Experiments.

The third season's crop in this series of experiment has now been obtained, and the trial may therefore be considered completed. The point under investigation in these experiments has been to determine the relative cropping qualities of "first" and "second" runners, and the details of the scheme may be found on reference

to last year's Report. From results published therein, it was found that the total crops of 1907 and 1908 from the five varieties under trial were 712¾lbs. for the "first" runners, and 607¼lbs. for the "second" runners. The following table gives the complete statistics to the end of the trial :—

CROPS FROM "FIRST" AND "SECOND" RUNNERS FOR 1907, 1908, AND 1909.

Name of Variety.	Yield in lbs. from "First" Runners.	Yield in lbs. from "Second" Runners.
Royal Sovereign 1907 ..	13½	7
Do. 1908 ..	177¼	135½
Do. .. 1909 ..	193¼	157
Sir Joseph Paxton 1907 ..	24	17¼
Do. 1908 ..	223½	240¾
Do. 1909 ..	165½	154
Monarch 1907 ..	5½	3
Do. 1908 ..	138½	121¾
Do. 1909 ..	139½	130¾
President 1907 ..	6½	4
Do. 1908 ..	80¼	51
Do. 1909 ..	213	98
Latest of All 1907 ..	½	½
Do. 1908 ..	44	26¾
Do. .. 1909 ..	93½	60
Total yield for 1907, 1908 & 1909	1517½	1207

The larger yield from the "firsts," already obtained in 1907 and 1908, has been therefore continued in 1909 ; and the difference in the third year's results has been more pronounced than in either of the two previous years. Taking the varieties separately, President gave the greatest difference ; while Royal Sovereign and Latest of All gave results definitely in favour of the "first" runners. There was a slight balance in favour of the "first" in the case of Monarch : but Paxton's gave practically the same yield for both sets. There is therefore good evidence that "first" runners tend to be more fruitful than "second" ; and there is a sufficient margin of difference in the yields to make it a matter of practical importance to the grower to select only "first" runners for planting.

PRUNING EXPERIMENTS ON GOOSEBERRIES.

A series of experiments on the pruning of gooseberry bushes was started during the early spring of 1908 on bushes planted in Plantation No. I., in 1905. Previous to the beginning of this trial, all the bushes were pruned on the "hard" system described below. Four varieties are under trial, these being Whinham's Industry, Keepsake, Crown Bob, and Lancashire Lad. There are

four rows of each, two of which are still being pruned on the "hard," and the remaining two on the "light" system. What is here termed the "hard" system is that commonly adopted in districts outside the larger fruit-growing areas. It consists in clipping back fairly hard all the leading shoots of the bush and trimming the laterals still harder, so that its surface is more or less regularly spherical, like a well-trimmed and closely clipped bush. Superfluous growth in the centre of the bush is also reduced. It is made up therefore of a comparatively dense and restricted branching system. The "light" system is found more commonly in the large gooseberry-growing districts, and differs considerably in character from the preceding. The leading shoots are not cut back so closely, while the laterals are more reduced than in the "hard" system, the object being to allow ample room for the insertion of the hand when picking the fruit. All superfluous wood in the centre of the bush is also cleared. A lightly-pruned bush, therefore, differs very considerably in appearance from a hard-pruned one, being comparatively loose, straggling, and open, instead of close-cut, regular, and dense. as in the latter case. Ease and economy of time in gathering the fruit, and an improved quality of berry, both as regards size and colour, owing to the open character of the bush, are the main advantages claimed for the "light" system. The question of the yield of the crop has been in dispute ; and the experiments now being carried on are mainly directed to the settlement of that point. The appended table gives the yield of each variety under the two systems for the seasons 1908 and 1909.

Crops for 1908 and 1909 in Gooseberry Pruning Trials.

Name of Variety.	Yield in lbs. from "light" pruned bushes.	Yield in lbs. from "hard" pruned bushes.
Crown Bob 1908..	28½	21¾
Do. 1909 Picked green	116½	100¼
Do. 1909 Picked ripe ..	178¼	116
Keepsake 1908	72	105¼
Do. 1909 Picked green	179	103½
Do. 1909 Picked ripe ..	202¾	249½
Lancashire Lad 1908	90½	101½
Do. 1909 Picked green	57¼	76¼
Do. 1909 Picked ripe ..	102¾	105¼
Whinham's Industry 1908 ..	97	85½
Do. 1909 Picked green	176	134
Do. 1909 Picked ripe ..	230½	205
Total yield for 1908 and 1909 ..	1531	1403¾

The records, therefore, for the first two seasons of the trials show that in the total for all varieties there is a slight, but definite, gain on the side of the "light" system. For Crown Bob and Whinham's Industry the gain is comparatively large; the Keepsake returns are practically the same for both systems; and the Lancashire Lad crops give a small gain to the "hard" system. While the question cannot be considered settled by two seasons' results, it is evident that thus far any numerical superiority in the berries on the "hard" pruned bushes has been generally more than counterbalanced by the larger size and weight of the individual berries on the "light" pruned bushes. The latter also exhibit superiority in quality, and consequently tend to command a better price. The economy of time and labour in gathering the fruit is so markedly in favour of the latter system that, if the crop returns continue as they have begun, there will be no doubt which is the more profitable system for the grower.

New Experimental Vintage Orchards.

Last season the Board of Agriculture, the Bath and West Society, and the County Councils of Devon, Somerset, Gloucester, Hereford, Worcester and Monmouth, each received grants of 300 vintage trees raised in the Nursery at the Institute for the purpose of establishing experimental vintage orchards at various centres. Thirty-two orchards in all were planted during the planting season of 1908-9; and reports from the respective centres show that practically all the trees sent out have become satisfactorily established and, considering the nature of the past season, have made substantial progress. The individual reports are given in Appendix F. In addition to these, over 1,000 other trees from the Nursery were supplied to Members and Associates of the Institute. Thus it is an encouraging sign for the future to find that the question of the provision of fresh vintage orchards of standard varieties is receiving serious attention. During the present planting season, another lot of trees is being distributed, 150 being given to each of the above-mentioned bodies; and a list of the orchards will be found in Appendix E. A considerable number are being again taken by Members and Associates. At the same time fresh stocks are being planted in the Nurseries to take the places of those already sent out, so that a regular supply of trees may be forthcoming for future planting; and these are being worked with the varieties which have given the best results in the experimental work in the cider-house. It is desired to make it

perfectly clear that, in propagating vintage trees for distribution, the Institute has no intention of entering into competition with the limited number of nurserymen who already propagate vintage varieties for sale. It is of the highest importance to the future of the industry that growers should have no difficulty in obtaining a sufficient supply of young trees for planting. At the present time, many of the varieties which have done best in the experimental trials are not propagated by any nurserymen ; and of the recognised standard sorts which are propagated it is frequently impossible for growers to obtain the requisite number. It is the purpose, therefore, of the Institute to supplement the work of the nurserymen by propagating the best varieties not already obtainable in commerce ; and if anyone in the trade wishes to introduce any such stocks, the Institute will be glad to furnish him with the necessary supply of buds and grafts, true to name, so far as they are available, and to assist in procuring fresh supplies, where necessary.

APPENDIX A.—The Characters of Single Variety Ciders made in 1908-9.

Name of Variety.	Date of Making.	Specific Gravity.	Percentage Composition of Juice.		Specific Gravity March 31, 1910.	Remarks on Characters of Ciders.
			Malic Acid.	Tannin.		
Sharp Varieties.						
GOLDEN CIDER RUSSET (Somerset)	Dec. 19, 1908	1·065	·63	·164	1·001	A medium sharp, dry cider: full-bodied, and of fair flavour and aroma. Fermented rather rapidly. Can be used alone, but better blended.
KINGSTON BLACK .. (G. Batten, Pensford, Somerset)	Dec. 23, 1908	1·064	·42	·184	1·041	A sweet, full-bodied, moderately soft cider of slight briskness and good flavour and aroma. Rate of fermentation very slow. Very good alone.
Ditto (J. Batten, Pensford, Somerset) ..	Dec. 23, 1908	1·071	·51	·186	1·041	A cider of very similar character to the preceding, but somewhat brisker.
Ditto (Failand, Somerset)	Dec. 18, 1908	1·071	·56	·140	1·050	A very sweet, rich, full-bodied cider of brisk character. Aroma well-marked and pleasant, and flavour good, but slightly hard. Rate of fermentation very slow. Good alone, but better softened with a small quantity of a pure sweet type.
Ditto (W. Davies, Pensford, Somerset) ..	Dec. 23, 1908	1·061	·48	·228	1·041	A sweet, full-flavoured cider of medium briskness and appreciable bitterness. Rate of fermentation very slow. Good alone.
Ditto (Woolston, Somerset)	Dec. 19, 1908	1·073	·47	·242	1·044	A very sweet, rich, full-bodied cider of soft character and medium briskness. Flavour and aroma very good. Fermentation very slow. Blending unnecessary.
Ditto (Martock, Somerset)	Nov. 28, 1908	1·071	·67	·192	—	A very rich, sweet, full-bodied cider of decided briskness. Flavour and aroma very good. Rate of fermentation extremely slow. Excellent alone.
Ditto (C. Veads, Pensford, Somerset) ..	Dec. 23, 1908	1·065	·45	·258	1·040	A sweet, full-bodied cider of mild briskness and good flavour and aroma. Bitterness rather marked. Rate of fermentation slow. Good alone, but improved by blending to tone down bitterness.

APPENDIX A.—The Characters of Single Variety Ciders made in 1908 9.

Name of Variety.	Date of Making.	Specific Gravity.	Percentage Composition of Juice.		Specific Gravity March 31, 1910.	Remarks on Characters of Ciders.
			Malic Acid.	Tannin.		
KINGSTON BLACK—*con'd.* (Dorset)	Nov. 28, 1908	1·060	·50	·142	—	A sweet, full-bodied cider of fair briskness and good flavour and aroma. Rate of fermentation slow. Good alone.
Ditto (Backwell, Somerset)	Nov. 21, 1908	1·069	·57	·254	—	A sweet, brisk cider of good body and well-marked astringency. Flavour good, but rather rougher and harder than the average for this variety. Rate of fermentation slow. Good alone, but may be improved by the addition of a small quantity of a pure sweet type.
MIDDLE MILL BRANDY (Gloucester)	Nov. 5, 1908	1·048	·59	·178	1·032	A sweet, fairly full-bodied cider of medium briskness. Resembles the Kingston Black type, but is inferior in richness. Flavour and aroma good. Rate of fermentation very slow. Useful alone or for blending.
WINTER QUARRENDEN (Somerset)	Dec. 21, 1908	1·049	·65	·146	1·004	A brisk dry cider of fair body, but lacking in quality. Flavour and aroma fair. Rate of fermentation moderately rapid. Better blended than alone.
Bitter Sweet Varieties.						
APPLERIDGE PIPPIN .. (Gloucester)	Nov. 5, 1908	1·063	·22	·314	1·008	A rather bitter, medium dry cider of good body and strength, and fair flavour and aroma. Rate of fermentation moderate. Requires blending.
DABINETT .. .. .. (Somerset)	Dec. 21, 1908	1·064	·17	·364	1·024	A medium sweet cider of marked bitterness. Aroma well-developed and pleasant, and flavour full and good. Rate of fermentation slow. A good variety for blending. Too bitter alone.
EASTHAM .. .. .. (Worcester)	Dec. 19, 1908	1·065	·23	·206	1·026	A sweet, full-bodied cider of good quality. Flavour and aroma pleasant, and bitterness hardly marked. Rate of fermentation slow. A very promising new variety, which can be used alone, although improved by blending with a brisker cider.

SILVER CUP .. .. (Somerset)	Dec. 21, 1908	1·067	·15	·336	1·010	A medium dry, full-bodied cider of marked bitterness. Aroma pleasant, and flavour good and free from harshness. Rate of fermentation moderate. A very useful bittersweet variety for blending.
SMYTH-OSBOURNE'S No. II. (Devon)	Dec. 21, 1908	1·061	·24	·438	1·005	A dry, very bitter, strong cider of rather harsh quality. Aroma and flavour fair. Rate of fermentation moderately rapid. Requires blending.
SMYTH-OSBOURNE'S No. III. (Devon)	Dec. 21, 1908	1·058	·21	·224	1·023	A medium sweet, fairly rich cider with very mild bitter flavour. Aroma pleasant. Rate of fermentation moderately slow. Better blended than alone.
SMYTH-OSBOURNF'S No. IV. (Devon)	Dec. 21, 1908	1·051	·22	·272	1·000	A dry, rather coarse cider of slight bitterness. Flavour and aroma moderate. Rate of fermentation fast. Requires blending.
SMYTH-OSBOURNE'S No. VI. (Devon) ..	Dec. 21, 1908	1·049	·16	·246	1·007	A medium dry cider with slight bitter, rather rough flavour. Rate of fermentation moderately rapid. Requires blending, and lacks body.
WESTON No. I. .. .. (Hereford)	Dec. 19, 1908	1·062	·17	·282	1·008	A medium dry cider, full-flavoured and of good strength. Bitterness slight and aroma well marked. Rate of fermentation moderate. Requires blending.
WESTON No. II. .. .. (Hereford)	Dec. 19, 1908	1·065	·17	·228	1·025	A medium sweet cider of good body and strength. Flavour pleasant with slight bitter twang, and aroma good. Rate of fermentation slow. A very useful cider for blending; slightly too insipid and lacking in briskness alone.

Appendix B.—Analyses of Apples and Pears, 1909-10.

The following table contains the results of the analyses of the juices of varieties of apples and pears examined during the past season. In addition to the usual determinations given in preceding seasons, figures showing the comparative rates of fermentation of the individual juices have been included. These were arrived at by taking the average daily fall in the specific gravity of the juice at a temperature of 28° C. The actual number quoted is the number of points of specific gravity lost daily, the specific gravity of water at 15° C. being taken for this purpose as 1000 instead of 1.000, as is usual in cider work. Thus, instead of considering a fall in gravity from 1.050 to 1.0455 as one of .0055 points, it is reckoned as 5.5 points for the purpose of this table. With this additional information the statistics now given are sufficient to enable a very fair estimate of the vintage value of any variety dealt with to be formed. Not only is the richness in sugar and, therefore, the potential alcoholic strength indicated by the specific gravity, but also the kind of blending required—which may be deduced from the malic acid and tannin figures—is to be seen; while the suitability of the variety for the production of a sweet or dry cider is shown by the rate of fermentation of the juice.

Among this season's results special attention may be called to those of the Ashton varieties. All of these are grown in the Old Orchard at the Institute, and they comprise the majority of the trees there. Most of the remaining trees have already been included in previous seasons' Reports. If the whole of these figures are taken together, they furnish what is probably the most complete examination of the fruit of a typical English vintage orchard which has yet been made. That a very great improvement in the composition of such an orchard is needed can be seen at a glance. The majority of the sorts are obviously very inferior; and it is plain that no good cider could be expected from such an orchard, if the different kinds of fruit were mixed indiscriminately. The value of selection has been demonstrated very clearly in this case. Each season the average quality of the cider made from the fruit of this orchard improves; and the improvement is due almost solely to the fact that the qualities of the individual varieties are gradually becoming better known, so that blending to better advantage is annually achieved. This particular case is an excellent example of the necessity for a maker to learn as much as possible of the vintage qualities of his available varieties of apples, if he wishes to improve the general quality of his cider.

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.			Grower.	District.
		Total Sugar. Approximate.	Malic Acid.	Tannin.		
APPLES.						
ANSELL	1·058	12 —14	·67	·160	—	D. J. Phelps .. Tibberton G.
Ditto	1·044	8·5 —10·5	·28	·160	—	A. D. Willcox .. Dumbleton W.
ARGILE GRISE	1·047	9·25— 11·25	·19	·170	—	Cider Institute .. Long Ashton S.
ASHFORD'S No. 1	1·053	10·75—12·75	·45	·096	—	A. Ashford .. Chedzoy S.
ASHTON BITTER WHITE ..	1·052	10·5 — 12·5	·43	·366	—	Cider Institute .. Long Ashton S.
ASHTON BROWN JERSEY ..	1·046	9 — 11	·22	·136	—	Ditto .. Ditto
ASHTON CRAB	1·061	12·75—14·75	2·37	·674	2·8	W. Tucker .. Ditto
ASHTON EARLY RED JERSEY	1·045	8·75—10·75	·22	·414	5·2	Cider Institute .. Ditto
ASHTON No. 1	1·052	10·5 —12·5	·95	·336	3·1	Ditto .. .. Ditto
Do. No. 10	1·043	8·25—10·25	1·46	·198	6·4	Ditto .. .. Ditto
Do. No. 11	1·039	7·25—9·25	2·14	·236	5·6	Ditto .. .. Ditto
Do. No. 12	1·066	14 —16	·24	·252	—	Ditto .. .. Ditto
Do. No. 13	1·054	11 —13	1·43	·112	8·0	Ditto .. .. Ditto
Do. No. 20	1·051	10·25—12·25	·87	·196	8·2	Ditto .. .. Ditto
Do. No. 26	1·050	10 —12	·97	·164	3·1	Ditto .. .. Ditto
Do. No. 28	1·047	9·25—11·25	2·10	·408	1·0	Ditto .. .. Ditto
Do. No. 30	1·051	10·25—12·25	1·41	·192	4·6	Ditto .. .. Ditto
Do. No. 32	1·046	9 —11	·22	·136	3·4	Ditto .. .. Ditto
Do. No. 35	1·044	8·5 —10·5	·57	·172	5·0	Ditto .. .. Ditto
Do. No. 35a	1·061	12·75—14·75	·98	·088	6·5	Ditto .. .. Ditto
Do. No. 36	1·059	12·25—14·25	·45	·212	—	Ditto .. .. Ditto
Do. No. 38	1·042	8·0 —10·0	·47	·130	4·2	Ditto .. .. Ditto
Do. No. 39	1·040	7·5 — 9·5	·42	·112	3·3	Ditto .. .. Ditto
Do. No. 45	1·037	6·75— 8·75	·19	·168	6·7	Ditto .. .. Ditto
Do. No. 47	1·047	9·25—11·25	·54	·104	7·8	Ditto .. .. Ditto
Do. No. 48	1·051	10·25—12·25	1·35	·268	4·7	Ditto .. .. Ditto
Do. No. 49	1·052	10·5 —12·5	·59	·192	—	Ditto .. .. Ditto

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.			Grower.	District.
		Total Sugar. Approximate.	Malic Acid.	Tannin.		
APPLES—*continued.*						
ASHTON No. 50	1·044	8·5 —10·5	·19	·204	6·7	Ditto	Ditto
Do. No. 54	1·054	11 —13	·32	·164	—	Ditto	Ditto
Do. No. 55	1·048	9·5 —11·5	·97	·294	9·3	Ditto	Ditto.
Do. No. 58	1·044	8·5 —10·5	1·30	·202	—	Ditto	Ditto
Do. No. 62	1·043	8·25—10·25	·47	·156	8·2	Ditto	Ditto
Do. No. 63	1·053	10·75—12·75	·34	·344	10·8	Ditto	Ditto
Do. No. 64	1·040	7·5 — 9·5	·80	·282	5·0	Ditto	Ditto
Do. No. 65	1·053	10·75—12·75	·95	·120	6·8	Ditto	Ditto
Do. No. 66	1·040	7·5 — 9·5	·19	·224	2·9	Ditto	Ditto
Do. No. 67	1·047	9·25—11·25	·94	·140	3·0	Ditto	Ditto
Do. No. 70	1·052	10·5 —12·5	·89	·172	7·2	Ditto	Ditto
Do. No. 75	1·058	12 —14	·10	·212	10·4	Ditto	Ditto
Do. No. 77	1·051	10·25—12·25	·63	·148	—	Ditto	Ditto
Do. No. 78	1·051	10·25—12·25	·43	·152	9·8	Ditto	Ditto
Do. No. 79	1·050	10 —12	·38	·240	8·6	Ditto	Ditto
Do. No. 80	1·038	7 — 9	·21	·130	—	Ditto	Ditto
Do. No. 81	1.045	8·75—10·75	·19	·242	5·0	Ditto	Ditto
Do. No. 82	1·051	10·25—12·25	·66	·140	8·0	Ditto	Ditto
Do. No. 85	1·041	7·75—9·75	·17	·182	5·2	Ditto	Ditto
Do. No. 86	1·040	7·5 — 9·5	·64	·100	—	Ditto	Ditto
Do. No. 95	1·045	8·75—10·75	·53	·090	4·1	Ditto	Ditto
Do. No. 96	1·042	8 —10	·52	·092	13·0	Ditto	Ditto
Do. No. 97	1·052	10·5 —12·5	·39	·320	6·3	Ditto	Ditto
Do. No. 100	1·044	8·5 —10·5	·92	·224	4·6	Ditto	Ditto
Do. No. 101	1·035	6·25— 8·25	1·12	·256	5·2	Ditto	Ditto
Do. No. 105	1.038	7 —10	·55	·140	6·8	Ditto	Ditto
Do. No. 107	1·049	9·75—11·75	·45	·226	4·8	Ditto	Ditto
Do. No. 109	1·046	9 —11	·37	·286	4·9	Ditto	Ditto
Do. No. 110	1·042	8 —10	·17	·174	4·5	Ditto	Ditto

ASHTON	No. 117	1.049	9.75—11.75	·95	·334	—	Ditto	Ditto
Do.	No. 121	1·046	9 —11	·81	·042	7·7	Ditto	Ditto
Do.	No. 122	1·043	8·25—10·25	·19	·134	5·8	Ditto	Ditto
Do.	No. 123	1·041	7·75— 9·75	1·10	·062	6·2	Ditto	Ditto
Do.	No. 124	1.042	8 —10	·79	·120	7·2	Ditto	Ditto
Do.	No. 125	1·050	10 —12	·64	·126	3·4	Ditto	Ditto
Do.	No. 126	1.055	11·25—13·25	·32	·480	9·2	Ditto	Ditto
Do.	No. 130	1·045	8·75—10·75	·55	·098	—	Ditto	Ditto
Do.	No. 132	1·043	8·25—10·25	·18	·188	5·0	Ditto	Ditto
Do.	No. 133	1·061	12·75—14·75	·78	·162	9·4	Ditto	Ditto
Do.	No. 134	1·042	8 —10	·19	·188	6·0	Ditto	Ditto
Do.	No. 135	1·047	9·25—11·25	·81	·120	4·3	Ditto	Ditto
Do.	No. 137	1·043	8·25—10·25	·50	·150	—	Ditto	Ditto
Do.	No. 138	1.054	11 —13	·32	·292	5·6	Ditto	Ditto
Do.	No. 139	1·038	7 — 9	·19	·136	—	Ditto	Ditto
Do.	No. 141	1·050	10 —12	1·04	·182	5·4	Ditto	Ditto
Do.	No. 143	1.050	10 —12	1·00	·204	—	Ditto	Ditto
Do.	No. 144	1·055	11·25 —13·25	·83	·224	6·7	Ditto	Ditto
Do.	No. 148	1·063	13·25—15·25	·90	·228	8·6	Ditto	Ditto
Do.	No. 152	1·054	11 —13	·44	·360	7·2	Ditto	Ditto
Do.	No. 153	1·046	9 —11	·25	·170	4·6	Ditto	Ditto
Do.	No. 154	1·039	7·25— 9·25	·94	·062	3·5	Ditto	Ditto
Do.	No. 155	1·052	10·5 —12·5	·57	·116	—	Ditto	Ditto
Do.	No. 156	1·051	10·25—12·25	·74	·064		Ditto	Ditto
Do.	No. 157	1·042	8 —10	·32	·184	5·4	Ditto	Ditto
Do.	No. 158	1·049	9·75—11·75	·94	·084	6·0	Ditto	Ditto
Do.	No. 159	1·055	11·25—12·35	·50	·160	8·6	Ditto	Ditto
Do.	No. 163	1·045	8·75—10·75	·28	·122	5·4	Ditto	Ditto
Do.	No. 167	1.047	9·25—11·25	1·17	·124	4·2	Ditto	Ditto
Do.	No. 171	1·049	9·75—11·75	·52	·156	4·0	Ditto	Ditto
Do.	No. 172	1·036	6·5 — 8·5	·45	·044	9·0	Ditto	Ditto
Do.	No. 173	1·046	9 —11	·82	·104	3·5	Ditto	Ditto
Do.	No. 176	1.059	12·25—14·25	·95	·236	9·6	Ditto	Ditto
Do.	No. 177	1·045	8·75—10·75	·47	·084	6·5	Ditto	Ditto
Do.	No. 181	1·043	8·25—10·25	1·06	·324	5·2	Ditto	Ditto
Do.	No. 182	1·068	14·5 —16·5	1.068	·152	10·0	Ditto	Ditto

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.				Grower.	District.
		Total Sugar. Approximate.	Malic Acid.	Tannin.			
APPLES—*continued.*							
ASHTON No. 183	1.047	9·25—11·25	1·04	·194	1·9	Ditto	Ditto
Do. No. 185	1·040	7·5 — 9·5	·46	·192	—	Ditto	Ditto
Do. No. 187	1·045	8·75—10·75	·50	·044	5·5	Ditto	Ditto
Do. No. 188	1·050	10 —12	·71	·172	3·5	Ditto	Ditto
Do. No. 189	1·054	11 —13	·37	·200	—	Ditto	Ditto
Do. No. 190	1·042	8 —10	·26	·208	4·4	Ditto	Ditto
Do. No. 191	1·056	11·5 —13·5	·63	·116	4·0	Ditto	Ditto
Do. No. 194	1·043	8·25—10·25	·94	·156	4·7	Ditto	Ditto
Do. No. 200	1·066	14 —16	·98	·124	—	Ditto	Ditto
Do. No. 201	1·063	13·25—15·25	·58	·156	—	Ditto	Ditto
Do. No. 204	1·055	11·25—13·25	·45	·192	8·2	Ditto	Ditto
Do. No. 206	1·055	11·25—13·25	·63	·104	—	Ditto	Ditto
ASHTON RUSSET JERSEY ..	1·057	11·75—13·75	·24	·280	5·9	Ditto	Ditto
ASHTON WHITE	1·052	10·5 —12·5	·28	·257	4·7	Ditto	Ditto
BEALY DOWN PIPPIN ..	1·046	9 —11	·28	·084	—	Ditto	Ditto
BELL	1·050	10 —12	·32	·058	15·7	Ditto	Ditto
BELLE NORMAN	1·046	9 —11	·24	·236	—	A. D. Wilcox ..	Dumbleton W.
BESS POOL	1·063	13.25—15.25	·71	·124	—	D. J. Phelps ..	Tibberton G.
BLACK FOXWHELP	1·053	10.75—12.75	1·29	·116	—	Ditto	Ditto
BRAMTOT	1·037	6.75— 8.75	·48	·050	12·3	Cider Institute ..	Long Ashton S.
BRANDY	1·052	10.5 —12·5	·62	·100	9·2	Ditto	Ditto
BRAN ROSE	1·046	9 —11	·32	·104	·68	R. H. Cazalet ..	Castlemorton W.
BROWN'S No. 1	1·055	11.25—13.25	·59	·192	—	A. Brown	Failand S.
BROWN SNOUT	1·047	9.25—11.25	·22	·156	—	W. Child	Nunnington H.
BUSH	1·055	11.25—13.25	·72	·122	—	D. J. Phelps ..	Tibberton G.
BUTLEIGH No. 14	1·058	12 —14	·34	·108	6·8	R. Neville Grenville	Butleigh S.
Do. No. 74	1·052	10.5 —12.5	·25	·100	8·0	Ditto	Ditto
Do. No. 75A	1·058	12 —14	·10	·212	2·8	Ditto	Ditto

BUTLEIGH No. 75B	1·051	10.25—12·25	·40	·152	7·0	Ditto	Ditto D.
BUTTERBOX	1·045	8.75—10.75	·53	·140	3·6	W. Bickford ..	Barton D.
CAMBRIDGE QUEENING ..	1·059	12.25—14·25	·88	·100	—	D. J. Phelps ..	Tibberton G.
CAP OF LIBERTY	1·055	11·25—13·23	·92	·186	—	H. J. Davis ..	Sutton Montis S.
CAPTAIN KERNEL	1·059	12·25—14·25	1·02	·104	—	D. J. Phelps ..	Tibberton G.
CARDIVE FORESTIER ..	1·045	8·75—10·75	·32	·240	11·0	Cider Institute ..	Long Ashton S.
CHERRY PEARMAIN	1·045	8·75—10·75	·48	·168	—	Ditto	Ditto
CHEVALLIER	1·076	16.5 —18·5	·25	·152	—	Ditto	Ditto
CHISEL JERSEY	1·060	12.5 —14.5	·18	·364	—	A. Ashford ..	Chedzoy S.
Do. Do.	1·060	12.5 —14.5	·13	·242	—	H. J. Davis ..	Sutton Montis S.
Do. Do.	1·055	11.25—13.25	·19	·288	5·0	J. H. Symes ..	Martock S.
Do. Do.	1·054	11 —13	·27	·298	6·6	C. Porter	East Lambrook S.
COLLEGE	1·049	9.75—11.75	·63	·156	—	W. Child	Nunnington H.
CORSET HILL	1·055	11·25—13·25	·80	·128	—	D. J. Phelps ..	Tibberton G.
COUNSELLOR	1·043	8.25—10·25	·24	·216	6·0	A. T. Price ..	Berkeley G.
COURT ROYAL	1·051	10·25—12·25	·15	·112	8·6	R. Neville Grenville	Butleigh S.
COWARNE RED	1·058	12 —14	·81	·204	—	D. J. Phelps ..	Tibberton G.
CUMMY NORMAN	1·042	8 —10	·16	·080	—	Cider Institute ..	Long Ashton S.
DABINETT	1·050	10 —12	·31	·160	—	J. H. Symes ..	Martock S.
DARTMOUTH CRAB	1·061	12·75—14·75	·61	·174	—	Cider Institute ..	Long Ashton S.
DAVIS' FAVOURITE	1·056	11.5 —13.5	·30	·288	—	H. J. Davis ..	Sutton Montis S.
DEVONSHIRE PIPPIN ..	1·048	9.5 —11.5	·61	·108	—	M. P. Price ..	Tibberton G.
DOVE	1·055	11·25—13·25	·24	·248	—	H. J. Davis ..	Sutton Montis S.
DOWDESWELL	1·050	10 —12	·72	·058	2·8	R. H. Cazalet ..	Castlemorton W.
DYMOCK RED	1·056	11·5 —13·5	·48	·252	3·4	W. Wallis	Ledbury H.
FAIR MAID OF DEVON ..	1·060	12·5 —14·5	·32	·136	—	Cider Institute ..	Long Ashton S.
FARMER'S FRIEND	1·056	11·5 —13·5	·22	·180	2·9	C. Porter	East Lambrook S.
FILL BARREL	1·056	11·5 —13·5	·27	·286	—	H. J. Davis ..	Sutton Montis S.
FOOTLANDS	1·047	9.25—11·25	·20	·110	6·2	Cider Institute ..	Long Sutton S.
FOXWHELP	1·048	9.5 —11.5	1·30	·308	1·5	W. Wallis.. ..	Ledbury H.
Do.	1·059	12·25—14·25	·75	·190	—	A. D. Willcox ..	Dumbleton W.
Do.	1·055	11·25—13·25	1·05	·248	—	D. J. Phelps ..	Tibberton G.
FREDERICK	1·053	10·75— 12·75	·83	·076	2·4	S. W. Mullins ..	Dingestow M.
FRENCH	1·062	13 —15	·94	·118	—	D. J. Phelps ..	Tibberton G.
FREQUIN AUDIEVRE	1·046	9 —11	·23	·308	—	Cider Institute ..	Long Ashton S.
FREQUIN ROUGE	1·050	10 —12	·28	·076	17·0	Ditto	Ditto

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.			Grower.	District.
		Total Sugar. Approximate.	Malic Acid.	Tannin.		
APPLES—*continued.*						
GLASTONBURY	1·066	14 —16	1·23	·144	—	A. D. Willcox ..	Dumbleton W.
GREASY PIPPIN	1·056	11·5 —13·5	·79	·136	—	D. J. Phelps ..	Tibberton G.
GREENINGS	1·053	10·75—12·75	·74	·116	—	A. D. Willcox ..	Dumbleton W.
GREEN WINDSOR	1·054	11 —13	·27	·272	2·9	J. H. Symes ..	Martock S.
HAGLOE CRAB	1·050	10 —12	1·21	·230	4·1	M. P. Price ..	Tibberton G.
Do. Do.	1·051	10·25—12·25	·78	·184	—	D. J. Phelps ..	Ditto G.
HALCOMBE	1·053	10·75—12·75	·14	·112	10·0	R. Neville Grenville	Butleigh S.
HORNERS	1·054	11 —13	·16	·148	4·2	Ditto	Ditto
Do.	1·072	15·5 —17·5	·28	·168	—	H. J. Davis ..	Sutton Montis S.
IMPROVED KINGSTON BLACK	1·049	9.75—11·75	·29	·104	11·2	Cider Institute ..	Long Ashton S.
JARROW BANK	1·047	9·25—11·25	·55	·084	11·5	Ditto	Ditto
JONES' SEEDLING	1·045	8·75—10·75	·60	·140	10·0	Ditto	Ditto
KINGSTON BLACK	1·047	9·25—11·25	·45	·118	4·0	J. B. Allison ..	Burrowbridge S.
Do. Do.	1·057	11·75—13·75	·51	·160	11·0	A. Ashford ..	Chedzoy S.
Do. Do.	1·061	12·75—14·75	·44	·196	—	H. J. Davis ..	Sutton Montis S.
Do. Do.	1·055	11·25—13·25	·56	·100	2·5	Rev. — Morgan ..	Flax Bourton S.
Do. Do.	1·052	10·5 —12·5	·47	·056	2·7	R. Neville Grenville	Butleigh S.
Do. Do. A.	1.062	13 —15	·55	·114	—	D. J. Phelps ..	Tibberton G.
Do. Do. B.	1·057	11·75—13·75	1·04	·148	—	Ditto	Ditto
Do. Do.	1·053	10·75—12·73	·44	·040	4·1	J. Slatter	Paxford W.
Do. Do.	1·057	11·75—13·75	·54	·146	2·9	W. Wallis.. ..	Ledbury H.
Do. Do.	1·066	14 —16	·55	·180		J. Watts	Backwell S.
Do. Do.	1·061	12·75—14·75	·55	·130	6·7	A. D. Willcox ..	Dumbleton W.
KNIGHT'S STRIPED JERSEY	1·051	10·25—12·25	·41	·154	7·2	R. P. Knight ..	Dundry S.
KNIGHT'S WOODBINE ..	1·045	8·75—10·75	·24	·096	—	Ditto	Ditto
LADY'S FINGER	1·050	10 —12	·58	·110	6·8	Cider Institute ..	Long Ashton S.
MAGGS' SEEDLING	1·049	9·75—11·75	·53	·184	15·0	Ditto	Ditto
MASTERS' JERSEY	1·059	12·25—14·25	·31	·274	—	H. J. Davis ..	Sutton Montis S.

MEDAILLE D'OR	1·069	14·75—16·75	·21	·256	—	Ditto	Ditto
MORGAN SWEET	1·040	7·5 — 9·5	·20	·044	9·2	Cider Institute	Long Ashton S.
NAYLOR'S	1·052	10·5 —12·5	·24	·276	—	A. D. Willcox	Dumbleton W.
NEVERBLIGHT	1·055	11·25—13·25	·33	·116	10·8	Cider Institute	Long Ashton S.
NEVER-DECEIVE-ME	1·057	11·75—13·75	·19	·112	8·0	R. Neville Grenville	Butleigh S.
NEW CADBURY	1·057	11·75—13·75	·23	·120	8·2	Ditto	Ditto
NORMANDY	1·050	10 —12	·41	·264	5·3	R. H. Cazalet	Castlemorton W.
NORTON BITTER	1·047	9·25—11·25	·22	·188	3·7	C. Porter	East Lambrook S.
NURSERY JERSEY	1·044	8·5—10·5	·31	·180	3·2	Ditto	Ditto
OLD BOY	1·070	15 —17	1·11	·192	—	D. J. Phelps	Tibberton G.
OLD CADBURY	1·056	11·5 —13·5	·15	·172	5·6	R. Neville Grenville	Butleigh S.
Do. Do.	1·058	12 —14	·29	·376	—	H. J. Davis	Sutton Montis S.
OLD FOXWHELP	1·055	11·25—13·25	·38	·120		Ditto	Ditto
PAINTED LADY	1·062	13 —15	·19	·128	5·2	H. Bowering	Kingston S.
PARSONS'	1·048	9·5 —11·5	·51	·100	—	J. H. Symes	Martock S.
PATCH	1·060	12·5 —14·5	·39	·088	—	A. D. Willcox	Dumbleton W
PHILIP NORMAN	1·050	10 —12	·23	·164	—	H. J. Davis	Sutton Montis S.
PORTER'S PERFECTION	1·044	8·5 —10·5	·51	·144	2·6	C. Porter	East Lambrook S.
PORT WINE	1·058	12 —14	·20	·264	—	H. J. Davis	Sutton Montis S.
PRIDE OF AUSTRALIA	1·042	8 —10	·62	·116	10·3	Cider Institute	Long Ashton S.
PRINCE ALBERT	1·051	10·25—12·25	·67	·124	5·8	A. D. Willcox	Dumbleton W.
RAMPER	1·049	9·75—11·75	·20	·094	6·5	R. H. Cazalet	Castlemorton W.
RED JERSEY	1·055	11·25—13·25	·21	·338	5·8	J. B. Allison	Burrowbridge S.
Do. Do. A	1·066	14 —16	·33	·330	—	H. J. Davis	Sutton Montis S.
Do. Do. B	1·072	15·5 —17·5	·25	·316	—	Ditto	Ditto
RED QUEENING	1·038	7 — 9	·74	·092	—	D. J. Phelps	Tibberton G.
REDSTREAK	1·059	12·25—14·25	·83	·232	—	A. D. Willcox	Dumbleton W.
Do.	1·048	9·5 —11·5	1·18	·272	—	D. J. Phelps	Tibberton G.
RED STYRE	1·060	12·5 —14·5	·62	·428	—	Ditto	Ditto
ROUSSIE	1·049	9·75—11·75	·35	·108	10·0	Cider Institute	Long Ashton S.
ROYAL JERSEY	1·058	12 —14	·24	·440	—	H. J. Davis	Sutton Montis S.
Do. Do.	1·061	12·75—14·75	·13	·134	—	Cider Institute	Long Ashton S.
ROYAL WILDING	1·053	10·75—12·75	·13	·164	—	Ditto	Ditto
Do. Do.	1·062	13 —15	·38	·323	6·0	W. Wallis	Ledbury H.
SANDFORD JERSEY	1·056	11·5 —13·5	·22	·400	—	H. J. Davis	Sutton Montis S.

Name of Variety.	Specific Gravity of Juice.	Percentage Composition of Juice.			Grower.	District.	
		Total Sugar. Approximate.	Malic Acid.	Tannin.			
APPLES—*continued*							
SANDFORD JERSEY	1·053	10·75—12·75	·28	·088	—	Cider Institute ..	Long Ashton S.
SARACEN	1·052	10·5 —12·5	·78	·136	5·8	J. H. Symes ..	Martock S.
SERJEANT	1·058	12 —14	·59	·344	—	H. J. Davis ..	Sutton Montis S.
SHARP'S MIDSUMMER ..	1·060	12·5 —14·5	·88	·044	11·0	Cider Institute ..	Long Ashton S.
SILVER CUP	1·060	12·5 —14·5	·19	·312	—	H. J. Davis ..	Sutton Montis S.
Do. Do.	1·062	13 —15	·20	·110	—	Cider Institute ..	Long Ashton S.
SKYRME'S KERNEL	1·075	11·75—13·75	·75	·272	—	D. J. Phelps ..	Tibberton G.
SLACK-MA-GIRDLE	1·050	10 —12	·19	·108	—	W. Bickford ..	Barton D.
SLATTER'S No. 1	1·050	10 —12	·77	·096	4·0	J. Slatter	Paxford W.
Do. No. 2	1·040	7·5 — 9·5	·71	·088	3·1	Ditto	Ditto
SNAP JACK	1·062	13 —15	·55	·072	5·9	H. Bowering ..	Kingston S.
SOMERSET REDSTREAK ..	1·045	8·75—10·75	·35	·204	—	H. J. Davis ..	Sutton Montis S.
SPREADING NORMAN ..	1·056	11·5 —13·5	·30	·356	7·3	W. Wallis	Ledbury H.
STYRE	1·070	15 —17	1·40	·224	—	D. J. Phelps ..	Tibberton G.
SUGAR PIPPIN	3·065	13·75—15·75	·69	·080	—	Ditto	Ditto
SUTTON'S DYMOCK	1·047	9·25—11·25	·11	·124	7·8	Sir Ed. Strachey	Pensford S.
SWEET ALFORD A.	1·055	11·25—13·25	·16	·120	—	C. Haydon ..	Chettiscombe D.
Do. Do. B.	1·051	10·25—12·25	·14	·124	—	Ditto	Ditto
Do. Do. C.	1·051	10·25—12·25	·13	·132	—	Ditto	Ditto
Do. Do. D.	1·055	11·25—13·25	·16	·270	—	Ditto	Ditto
Do. Do. E.	1·050	10 —12	·19	·134	3·1	Ditto	Ditto
SWEET KINGSTON SEEDLING	1·055	11·25—13·25	·15	·148	—	C. Porter	East Lambrook S.
TANNERS	1·059	12·25—14·25	·20	·236	8·7	R. Neville Grenville	Butleigh S.
TAYLOR'S BITTER	1·048	9·5 —11·5	·16	·136	6·8	C. Porter	East Lambrook S.
TAYLOR'S SPIE	1·050	10 —12	·49	·076	—	Cider Institute ..	Long Ashton S.
TOMMY HUNT	1·058	12 —14	·26	·248	—	H. J. Davis ..	Sutton Montis S.
TOM PUTT	1·058	12 —14	·74	·228	—	D. J. Phelps ..	Tibberton G.
TWISTBODY JERSEY	1·052	10·5 —12·5	·58	·176	3·2	R. Neville Grenville	Butleigh S.

TWISTBODY JERSEY	1·058	12 —14	·22	·352	3·0	J. H. Symes ..	Martock	S.
VICTORIA	1·054	11 —13	·30	·074	13·8	Cider Institute ..	Long Ashton	S.
WATTS' SWEET	1·051	10·25—12·25	·39	·092	10·2	J. Watts	Backwell	S.
WHITE BACHE	1·037	6·75— 8·75	·30	·114	—	Cider Institute ..	Long Ashton	S.
WHITE CLOSE PIPPIN ..	1·048	9·5 —11·5	·18	·244	2·8	J. Crofts	Sutton Montis	S.
WHITE JERSEY	1·054	11 —13	·18	·142	—	H. J. Davis ..	Sutton Montis	S.
Do. Do.	1·055	11.25—13.25	·19	·044	4·1	R. Neville Grenville	Butleigh	S.
WILDING NEVERBLIGHT	1·043	8·25 —10·25	·75	·092	—	J. H. Symes ..	Martock	S.
WOODBINE	1·045	8·75— 10·75	·14	·132	5·4	C. Haydon ..	Chettiscombe	D.
WOOLSTON SPICE	1·052	10·5 —12·5	·34	·106	—	Cider Institute ..	Long Ashton	S.
YARLINGTON MILL	1·037	6·75— 8·75	·17	·162	—	H. J. Davis ..	Sutton Montis	S.
YELLOW STYRE	1·072	15·5 —17·5	1·00	·232	—	D. J. Phelps ..	Tibberton	G.
PEARS.								
HUCCLECOTE	1·054	11 —13	·22	·030	—	M. Chart	Hucclecote	G.
OLDFIELD	1·057	11·75—13·75	·61	·272	1·6	W. Wallis	Ledbury	H.

APPENDIX C.—Returns from Variety Trials of Apples, Pears, Plums, and Small Fruits in Plantations I. and II.

Name of Variety.		Yield in lbs. 1909.
PLANTATION No. II.		
Apples—		
Bismarck	7 bushes and 3 standards	118¼
American Mother	„	4¾
King's Acre Pippin	„	21
Lady Sudeley	„	8¾
Lord Grosvenor	„	61¾
Warner's King	„	30¼
White Transparent	„	5
Court Pendu Plat	10 bushes	2¼
Frogmore Prolific	„	43¼
James Grieve	„	14
Lord Derby	„	52¾
Peasgood's Nonsuch	„	5¾
Potts' Seedling	„	5¾
Rival	„	31¼
Sturmer Pippin	„	40
Wealthy	„	16½
Pears—		
Conference	7 bushes and 3 standards	19½
Dr. Jules Guyott	„	12¾
Hessle	„	28½
Pitmaston Duchess	„	3
Bellissime d'Hiver	10 bushes	6¾
Durondeau	„	½
Emile D. Heyst	„	16
Plums—		
Denniston's Superb	7 bushes and 3 standards	6½
Pond's Seedling	„	6¾
Transparent Gage	„	6
Monarch	10 bushes	4½
Heron	„	1
Early Rivers	„	5
Czar	„	5
Strawberries—		
Royal Sovereign	200 3-year-old-plants	180
Auguste Nicaise	100 2-year-old plants	25¾
Dr. Hogg	„	16
Elton Pine	„	51
Givon's Late Prolific	„	53¼
Keen's Seedling	„	14¼
Leader	„	69½
President Loubet	„	10
Queen of Denmark	„	34
Scarlet Queen	„	13

APPENDIX C—*continued.*

Name of Variety.		Yield in lbs. 1909.
PLANTATION No. II.—*continued.*		
STRAWBERRIES—		
Stirling Castle	100 2-year-old plants	63
Trafalgar	,,	27
British Queen	70 2-year-old plants	15
La Grosse Sucree	,,	8
Louis Gauthier	,,	7
Sir C. Napier	,,	33
St. Joseph	,,	3¼
BLACK CURRANTS—		
Boskoop Giant	30 plants	16
Ogden's Black	,,	36½
Black Prince	,,	19
Goliath	,,	11
Victoria	,,	16
RED CURRANTS—		
Cherry	30 plants	10
Comet	,,	14
La Hative	,,	9
La Versaillaise	,,	15
New Red Dutch	,,	39
Red American	,,	7
Red Grape	,,	10
La Fertile	,,	12
WHITE CURRANTS—		
La Transparent	30 plants	35
White Dutch Cut Leaf	,,	36
White Transparent	,,	27
White Versailles	,,	24

		Yield in lbs.		
		1909.	1908.	1907.
RASPBERRIES—				
Abundance	150 plants	78½	49¾	—
Baumforth's Seedling	,,	30	114½	56¾
Carter's Prolific	,,	28½	78½	22¾
Red Antwerp	,,	56½	141	30
Semper Fidelis (*a*)	,,	55¼	99¼	55¾
,, ,, (*b*)	,,	50	44	—
Lord Beaconsfield	,,	80½	115¼	—
Yellow Antwerp	,,	19½	100¼	45¾
White Magnum Bonum	,,	22¾	89¾	55¼

APPENDIX C—*continued.*

Name of Variety.		Yield in lbs.		
		1908.	1907.	1906.
PLANTATION No. II.—*continued.*				
GOOSEBERRIES—				
Blucher	20 bushels ..	15½	2½	6¼
Careless	„ ..	41	34	22¼
Early Sulphur	„ ..	30¾	7½	—
Faithful	„ ..	57	19	12¾
Falstaff	„ ..	38½	16	8¼
Fascination	„ ..	47	27¼	22¼
King of Trumps ..	„ ..	119	16	27½
Leader	„ ..	33½	7¾	16¾
Leveller	„ ..	49½	36¾	24¾
May Duke	„ ..	83½	3½	7½
Mount Pleasant ..	„ ..	32¾	9¾	4½
Red Warrington ..	„ ..	70¾	6¾	10
Surprise	„ ..	55½	28½	25
Telegraph	„ ..	60½	14¾	17¾
Golden Gem	10 bushes ..	11½	5	5¼
Gretna Green	„ ..	29	7¼	6¼
Dan's Mistake	„ ..	11	—	—
Diadem	„ ..	20¼	5¾	8¼
High Sheriff	„ ..	7¼	4¾	3½
Hero of the Nile ..	„ ..	6¾	3¾	2¼
Langley Gage	„ ..	61¾	4	5¼
Ringer	„ ..	8¾	2¼	3½
Thatcher	„ ..	17	7	5¾
Victoria	„ ..	33	1	6
Red Champagne ..	„ ..	23¾	3½	2
Transparent	„ ..	19	6¾	—

PLANTATION No. 1.		Yield in lbs.			
		1909.	1908.	1907.	1906.
GOOSEBERRIES—					
Crown Bob	90 plants	511	50¼	197	40½
Keepsake ..	„ ..	734¾	177¼	313½	70
Lancashire Lad	.. „ ..	341½	192	141	50
Whinham's Industry	„ ..	745½	183½	133	69
RASPBERRIES—					
Hornet ..	180 plants	90	224½	244¼	72
Northumberland Fillbasket	„ ..	165	205¼	266½	100
Norwich Wonder	„ ..	92	162¼	274½	81
Superlative ..	„ ..	71	128½	283¼	97
RED CURRANTS—					
Fay's Prolific ..	90 plants	320¼	48½	126	30½
Knight's Sweet Red	„ ..	233	63	97	48
Raby Castle ..	„ ..	480	126½	92¾	28
WHITE CURRANTS—					
White Dutch ..	90 plants	545	92	155	103

APPENDIX D.

The Date of Blossoming of Varieties of Apples, Pears, Plums and Small Fruits.

Variety.	Date of Flowering. 1909.	1908.
APPLES.		
Market varieties—		
Bramley's Seedling	May 5	May 11
Sturmer Pippin ..	,, 5	,, 9
James Grieve ..	,, 5	,, 13
Warner's King ..	,, 5	—
Stirling Castle ..	,, 6	,, 5
King of the Pippins..	,, 6	,, 12
Devonshire Quarrenden	,, 6	,, 5
Ecklinville	,, 7	,, 11
Allington Pippin ..	,, 7	—
Beauty of Bath ..	,, 7	,, 6
Blenheim Orange ..	,, 7	—
Charles Ross ..	,, 7	—
King's Acre Pippin..	,, 7	—
White Transparent..	,, 7	,, 11
Bismarck	,, 7	—
Worcester Pearmain	,, 7	,, 11
Lord Hindlip ..	,, 8	—
Houblon	,, 8	—
Lord Grosvenor ..	,, 9	—
Frogmore Prolific ..	,, 9	—
Wealthy	,, 9	,, 12
American Mother ..	,, 9	—
Lady Sudeley ..	,, 9	,, 14
Newton Wonder ..	,, 9	—
Lord Suffield ..	,, 9	,, 10
Cox's Orange Pippin	,, 9	,, 11
Wellington	,, 10	—
Potts' Seedling ..	,, 10	—
Lord Derby ..	,, 10	—
Peasgood's Nonsuch	,, 10	—
Lane's Prince Albert	,, 11	,, 11
Rival	,, 11	—
Gascoigne's Scarlet Seedling ..	,, 11	—
Royal Jubilee ..	,, 14	,, 27
Golden Noble ..	,, 14	—
Court Pendu Plat ..	,, 14	—
Coronation	,, 14	—
Vintage Varieties—		
Frequin Rouge ..	,, 8	,, 11
Cap of Liberty ..	,, 8	,, 14
Davis' Crab	,, 8	,, 15
Cardive Forestier ..	,, 8	,, 13
M. Jacques	,, 8	,, 11
Bealy Down Pippin	,, 8	,, 21
Ecarlatine	May 8	May 12
Pride of Australia ..	,, 8	—
Pride of Australia (Free stock) ..	,, 8	—
Eggleton Styre ..	,, 9	,, 12
Argile Grise ..	,, 9	—
Broad Leaf Jersey	,, 9	,, 15
Cherry Pearmain ..	,, 9	,, 21
Dymock Red ..	,, 9	,, 22
Redstreak	,, 9	,, 19
Court Royal.. ..	,, 9	,, 12
Reinette Obry ..	,, 9	,, 11
Rouge de Treves ..	,, 9	,, 24
Dove	,, 9	—
Victoria	,, 9	—
Hardwick	,, 9	,, 20
Maggs' Seedling ..	,, 9	—
Amere de Berthivest	,, 9	—
Rouge Bruyere ..	,, 9	—
No. 32	,, 9	—
Jarrow Bank ..	,, 9	—
Jarrow Bank (Free stock)	,, 9	—
Skyrme's Kernel ..	,, 10	—
Fair Maid of Devon	,, 10	—
Doux Amer ..	,, 10	,, 15
Sharpe's Midsummer	,, 10	—
Chiffers'	,, 10	—
No. 42	,, 10	—
Little Mother ..	,, 10	—
Umbrella	,, 10	—
Roussie	,, 10	,, 17
No. 61	,, 10	—
Dove Seedling ..	,, 10	—
King	,, 10	—
Glory of the West	,, 10	—
Vignons	,, 10	—
M. Jacques (Free stock)	,, 10	—
Improved Pound ..	,, 10	—
Cap of Liberty (Free stock)	,, 11	—
Cherry Norman ..	,, 11	,, 22
White Bache ..	,, 11	,, 21
Footlands, No. 2 ..	,, 11	,, 20
Royal Jersey ..	,, 11	,, 16
Somerset Redstreak	,, 11	—

APPENDIX D—*continued.*

Variety.	Date of Flowering. 1909.	1908.
APPLES—*continued.*		
Bramtôt	May 11	May 16
Cummy Norman ..	,, 11	—
Silver Cup	,, 11	—
Cowarne Red ..	,, 11	,, 19
Sweet Alford ..	,, 11	—
Kingston Black ..	,, 11	,, 20
Neverblight ..	,, 11	,, 20
Kingston Black Improved	,, 11	—
Woolston Spice ..	,, 11	,, 20
Red Foxwhelp ..	,, 11	—
Northwood ..	,, 11	—
Thomas Hunt ..	,, 11	—
Chisel Jersey ..	,, 11	—
Chisel Jersey (Free stock)	,, 11	—
Maggs' Seedling (Free stock)	,, 11	—
Dymock Red (Free stock)	,, 11	—
Court Royal (Free stock)	,, 11	—
Sweet Coppin ..	,, 11	—
Kingston Seymour ..	,, 11	—
William Anderson ..	,, 11	—
White Styre	,, 11	—
Eggleton Styre (Free stock)	,, 11	—
Doux Amer (Free stock)	,, 12	—
Cremière (Free stock)	,, 12	—
Ecarlatine (Free stock)	,, 12	—
Court Royal (Free stock)	,, 12	—
Tipper's Kernel ..	,, 12	—
Taylor's Spie ..	,, 12	—
Royal Wilding ..	,, 13	—
Knotted Kernel (Free stock)	,, 13	—
Knotted Kernel ..	,, 13	—
White Norman ..	,, 13	—
Broadleaf Norman	,, 13	,, 30
Yarlington Mill ..	,, 13	,, 19
Pytheres	,, 13	—
Sandford Jersey ..	,, 13	,, 21
Major	,, 13	—
Bedan des Parts ..	,, 13	—
Dabinett	,, 13	,, 22
Yeovil Sour ..	,, 13	—
Kingston Black (Free stock)	,, 13	—
Bell	May 13	—
Philip Norman ..	,, 13	—
Brown Jersey ..	,, 15	,, 22
White Jersey ..	,, 15	,, 22
White Close Pippin	,, 17	,, 20
Frequin Audiévre ..	,, 17	—
Royal Jersey (Crofts)	,, 17	—
Dabinett (Free stock)	,, 17	—
Reinette Obry (Free stock)	,, 17	—
Cowarne Red (Free stock)	,, 17	—
Chevallier	,, 17	—
Medaille d'Or ..	,, 18	,, 31
Strawberry Norman	,, 18	,, 27
Harry Masters ..	,, 18	,, 20
Dove	,, 18	—
Bedminster	,, 18	—
Skyrme's Kernel (Free stock)	,, 19	,, 22
Sharpe's Midsummer (Free stock) ..	,, 19	—
Sweet Alford (Free stock)	,, 19	—
Strawberry Norman (Free stock) ..	,, 19	—
Broadleaf Norman (Free stock) ..	,, 20	—
Medaille d'Or (Free stock)	,, 20	—
Broadleaf Jersey (Free stock)	,, 21	—
Rouge de Treves (Free stock)	,, 22	—
Harry Masters (Free stock)	,, 22	—
Frequin Audièvre (Free stock) ..	,, 22	—
Royal Jersey (Free stock)	,, 23	—
N.B. — Except where otherwise stated the apples are worked on the Paradise Stock.		
PEARS.		
Market Varieties—		
Louise Bonne de Jersey	Apl. 20	Apl. 22
Doyenne Boussoch	,, 24	,, 28
Durondeau	,, 26	May 1
Bellissime d'Hiver ..	,, 26	,, 1

APPENDIX D—*continued.*

Variety.	Date of Flowering. 1909.	1908.
PEARS—*continued.*		
William's Bon Chretien	Apl. 28	Apl. 30
Emile d'Heyst	,, 28	May 1
Beurre d'Amanlis	,, 28	,, 2
Conference	May 1	,, 1
Petite Marguerite	,, 1	—
Catillac	,, 3	,, 3
Pitmaston Duchess	,, 3	,, 2
Hessle	,, 3	—
Dr. Jules Guyot	,, 3	,, 1
Triomphe de Vienne	,, 4	—
Vintage Varieties—		
Taynton Squash	Apl. 30	,, 3
Moorcroft	,, 30	,, 6
Oldfield	May 5	,, 3
PLUMS.		
Mallard	Apl. 17	Apl. 19
Monarch	,, 17	,, 30
Jefferson	,, 17	—
Heron	,, 18	,, 30
Late Orange	,, 19	—
Denniston's Superb	,, 22	,, 30
Early Prolific	,, 22	,, 29
Early Transparent Gage	,, 22	,, 30
Victoria	,, 22	May 1
Purple Prolific	,, 23	—
Czar	,, 23	Apl. 30
Kirke's	,, 26	—
Belle de Louvain	,, 26	May 2
Pond's Seedling	,, 26	—
President	,, 28	,, 1
Comte Athens Gage	,, 28	—
BLACK CURRANTS.		
Black Prince	Apl. 27	
Victoria	,, 29	
Goliath	,, 29	
Boskoop	,, 30	
Ogden's Black	,, 30	

Varieties.	Date of Flowering. 1909.	1908.
RASPBERRIES.		
Hornet	May 25	
Lord Beaconsfield	,, 26	
Superlative	,, 26	
Norwich Wonder	,, 26	
Yellow Antwerp	,, 26	
White Magnum Bonum	,, 26	
Northumberland Fillbasket	,, 27	
Carter's Prolific	,, 27	
Red Antwerp	,, 28	
Semper Fidelis	,, 28	
Abundance	,, 28	
The Guinea	,, 28	
STRAWBERRIES.		
President	May 6	
Louis Gauthier	,, 9	
Stirling Castle	,, 10	
Sir C. Napier	,, 11	
La Grosse Sucree	,, 11	
Keen's Seedling	,, 11	
Auguste Nicaise	,, 11	
St. Joseph	,, 11	
Monarch	,, 12	
Royal Sovereign	,, 12	
St. Antoine du Padoue	,, 12	
Scarlet Queen	,, 13	
Reward	,, 13	
Bedford Champion	,, 13	
Dr. Hogg	,, 14	
Queen of Denmark	,, 14	
Leader	,, 14	
Perpetual	,, 16	
Sir Joseph Paxton	,, 17	
Latest of All	,, 17	
Trafalgar	,, 17	
British Queen	,, 17	
Climax	,, 18	
President Loubet	,, 20	
Givon's Late Prolific	,, 21	
Latest	,, 21	
Fillbasket	,, 21	
Elton Pine	,, 23	

APPENDIX E.—New Experimental Orchards Planted in 1909-10.

CENTRE.	VARIETIES SELECTED.			
	APPLES.			PEARS.
	Sharp.	Sweet.	Bittersweet.	
Devon County Trees.				
Axminster	Foxwhelp (16)	Eggleton Styre (16)	Strawberry Norman (16)	
Gloucester County Trees.				
Tibberton	Cap of Liberty (20) Cowarne Red (20) Kingston Black (20)	Eggleton Styre (20) Sweet Alford (20)	Dabinett (10) Knotted Kernel (10) Medaille d'Or (10) Strawberry Norman (20)	
Dymock				Barland (20) Barnet (10) Butt (20) Moorcroft (10) Oldfield (20) Taynton Squash (20)
Hereford County Trees.				
Leominster	Cap of Liberty (5) Cowarne Red (15) Dymock Red (20) Foxwhelp (10) Kingston Black (20) Redstreak (10)	Eggleton Styre (20)	Knotted Kernel (20) Medaille d'Or (10) Strawberry Norman (20)	

Monmouth County Trees.				
Sunnybank, Rhiwderin	Rouge de Treves (1)	Cremiere (13)	Bramtot (3) Cardive Forestier(1) Frequin Rouge (2) Medaille d'Or (16) Rouge Bruyere (12)	
Itton	Kingston Black (26)	Eggleton Styre (4)	Strawberry Norman (5)	Moorcroft (15)
Llansainttraed ..			Knotted Kernel (23)	
Llantillio Crossenny	Cherry Pearmain (9) Foxwhelp (9)		Silver Cup (9) Yarlington Mill (9)	
Llanddewi Court ..				Barland (12) Butt (12) Claret (13) Dandoc (4) Hellens Green (1) Holmer (8) Moorcroft (12) Oldfield (10) Pine (11) Taynton Squash (10)
Somerset County Trees.				
Axbridge	Cherry Pearmain (10) Cowarne Red (5) Dymock Red (10) Foxwhelp (10) Redstreak (10)	Broadleaf Norman (10) Killerton Sweet (10) Stubbard (10)	Cherry Norman (10) Cummy Norman (10) Harry Masters (10) Major (10) Medailled'Or (10) Royal Wilding (10) Yarlington Mill (10)	Barland (5) Barnet (5) Blakeney Red (5) Butt (10) Oldfield (10) Pine (5) Taynton Squash (10)

APPENDIX E.—New Experimental Orchards Planted in 1909-10.—*continued.*

CENTRE.	VARIETIES SELECTED.			
	APPLES.			PEARS.
	Sharp.	Sweet.	Bittersweet.	
Somerset County Trees (continued).				
East Compton ..	Redstreak (1)		Knotted Kernel (10)	Barland (3) Moorcroft (8) Oldfield (2) Taynton Squash (8)
Brent Knoll				Barland (10) Barnet (10) Moorcroft (10) Oldfield (10) Taynton Squash (10)
Worcester County Trees.				
Newnham		Broadleaf Norman (25)	Cherry Norman (25)	
Staunton Court ..	Redstreak (5)	Sweet Alford (5) Sweet Coppin (5)	Masters' Jersey (5) Somerset Redstreak (5)	Barnet (5) Moorcroft (5) Pine (5) Port (5) Taynton Squash (5)
Suckley	Cherry Pearmain (25) Kingston Black (15)		Knotted Kernel (5) Strawberry Norman (25)	
Bath and West Society's	*Trees.*			
Frampton Cotterell (Gloucester) ..	Cherry Pearmain (10) Kingston Black (10)	Sweet Alford (10)	Knotted Kernel (10) Strawberry Norman(10)	

Bath and West Society's Trees (continued)				
Westbury (Wilts) ..	Redstreak (5) Yeovil Sour (5)	Broadleaf Norman (5)	Knotted Kernel (5) Somerset Redstreak (5)	
Bassaleg (Monmouth)	Fair Maid of Devon (12)		Dabinett (14)	
Tyllwyd, Llangwm (Monmouth)	Cap of Liberty (1) Dymock Red (14) Kingston Black (1)		Royal Jersey (5) White Jersey (3)	
Sherborne (Dorset) ..	Cowarne Red (5) Redstreak (5)	Sweet Coppin (5)	Master's Jersey (5) Sandford Jersey (5)	
Board of Agriculture Trees				
Frampton Cotterell (Gloucester)	Red Foxwhelp (10)	Eggleton Styre (10) Stubbard (10)	Cherry Norman (10) Medaille d'Or (10)	
Itton (Monmouth) ..	Cap of Liberty (3)		Knotted Kernel (5)	Barland (13) Oldfield (8) Taynton Squash (11)
Llantillio (Monmouth)	Cap of Liberty (12) Cowarne Red (13)			
The Hendre (Monmouth) ..				Barnet (13) Blakeney Red (13) Butt (14) Claret (13) Port (13)
Treowen, Dingestow (Monmouth)	Cap of Liberty (10)		Knotted Kernel (15)	

APPENDIX F.—Reports on the Experimental Orchards Planted in 1908-9.

The following Reports on the experimental orchards planted last season have been received :—

Hereford.—Mr. A. J. Manning, County Horticultural Instructor, reports as follows :—The land on which the trees are planted is County Council property under the Asylums' Committee, but the Agricultural Education Committee paid the cost of planting and protecting, and will be responsible for the care of the trees. The 300 trees available were planted in one orchard, six acres in extent, with the object of testing the relative merits of some of the recognised good varieties already grown in the county, together with some of the best varieties grown in other districts, but practically unknown to Herefordshire growers. The list of varieties was given in last year's Report of the Institute. The soil is derived from the Old Red Sandstone formation, and is a good deep loam. For several years the land has been liberally treated. Details of the arrangement of the orchard, the methods and cost of planting and fencing, and the characters of the varieties selected, have been published in a leaflet issued by the County Council. Three types of tree-guards have been used, the cost per tree for each being 2s. 7½d., 4s. 5½d., and 4s. 11½d. respectively. The cost of planting, apart from fencing, was 1s. 6d. per tree. The square arrangement was adopted in planting, with 30 feet between the trees each way. Holes about 3½ feet in diameter were opened to a depth of 14 inches, and the bottom forked as deeply as possibly, the ground being thus broken to a total depth of 20 to 24 inches. After the stakes were securely fixed in holes 3 feet deep, the turf was chopped, laid on the forked subsoil, and made firm. The hole was then filled to within about two inches of the height of the surrounding soil, at which level the tree was planted. All damaged roots were carefully pruned before planting. About 4lb. of bone meal per tree was mixed with the remainder of the soil, the whole of which was placed about the roots. A mulch of manure was also given as a protection from frost and drought. The trees have done well, not one has been lost, and many of them have made 18 inches of growth, thanks to their well-rooted state at the time of planting. Canker developed in three of the trees rather badly on the stem,—about the end of the first season's growth—and these have been removed and re-planted. They may now be considered quite satisfactory. The trees were secured to the stake in the first place by straw bands ; but these have now been replaced by bands made from ½ inch rubber hose, which promise to be more permanent and reliable.

Gloucester.—Mr. G. H. Hollingworth, County Horticultural Instructor, has furnished the following report :—On receiving intimation from the Secretary of the National Fruit and Cider Institute that 300 trees of cider apples and perry pears would be placed at their disposal for establishing experimental orchards in Gloucestershire, the Agricultural sub-Committee, in the autumn of 1908, made the necessary arrangements for planting the trees on the estates of G. E. Lloyd-Baker, Esq., Hardwicke Court, near Gloucester, Charles Bathurst, Esq., Lydney Park, and Lord Fitzhardinge, Berkeley Castle. Each orchard comprises an area of about two acres in extent, the soil is of varying character, and cider is extensively made in the localities where the orchards are planted.

Every credit is due to the Institute for sending out strong, well-grown trees, which were delivered in good condition, and planted in December, 1908. In the spring of this year the trees all started well ; and in no case up to the present has it been found necessary to put in new trees, as there are no failures to record. In the various orchards the trees were planted about 30ft. apart, well staked, and fenced with the " Reliable " wire tree guard. In most cases the ground was left clear of turf in a circle round the tree of 4ft. in diameter, but the turf was replaced on the surface in a number of instances for the purposes of experiment. When the trees were inspected in September last it was observed that the leaves on the trees where the turf was buried were larger and more vigorous than in the cases where the roots were grassed over. In the orchard at Hardwicke ten trees each of nine varieties of cider apples were planted, with five trees each of two varieties of perry pears. At Lydney a similar experiment was carried out ; and at Berkeley, owing to the area of land at disposal being slightly less, the number of each of the nine varieties of apples was reduced to eight, with four trees each of two varieties of perry pears. In every case attention was paid to the inclusion of sweet apples, sharp apples, and bitter-sweets. Some of the varieties planted are grown in the county, but others are entirely unknown. They possess good reputations, however, and it is hoped that, if they turn out well in the new conditions, these experimental orchards will be the means of creating local interest and introducing into the different districts a good class of vintage. This is very desirable in view of the fact that the planting of apples and pears purely for cider and perry making has been neglected in recent years. One hundred and fifty trees have been allotted to the county this season, and arrangements are in hand for planting these in one orchard on the estate of M. P. Price, Esq., Tibberton Court, Gloucester.

Monmouth.—Mr. W. J. Grant, Director of Agricultural Education, has supplied the following particulars :—At Croesheolydd, Bassaleg, (Mr. Thos. Baker), an orchard is being planted on the property of Viscount Tredegar, the trees planted in the spring of 1909 have done remarkably well, the varieties planted being typical Somerset and Devenshire Cider Apples that have been selected for the purpose of blending well together.

The next orchard that is being planted on Viscount Tredegar's fine estate is that at Sunny Bank, Rhiwderin (Mr. A. R. Jones), where a fine set of the choicest Normandy varieties have and are being planted on a warm sunny slope.

Herefordshire varieties have been planted at Llantilio Crossenny, on the property of Sir Henry Mather Jackson, Bart., where it is hoped that a good orchard may be formed.

On the estate of Major-General Sir Ivor Herbert, Bart., M.P., two orchards have been started : one at Llansaintfraed (Mr. Morgan David), where a combination of Norman, Hereford, and Somerset varieties have been planted ; while at Tre Owen (Mr. Thos Davies), with the exception of Kingston Black, nothing but Herefordshire kinds have been planted. In these two orchards, especially in the latter, the trees have given a good account of themselves.

In the new cider orchard at Itton, on the Itton Court Estate, the property of Colonel W. E. C. Curre, Cap of Liberty has been planted with Herefordshire varieties on a high meadow, and although, owing to unavoidable circumstances these trees were not planted till late in March, 1909, every tree has done well.

The Tyllwyd, Llangwm, orchard is being planted on a stiff red clay soil with practically Somerset kinds. It was in this orchard only, with the exception of one tree at Croesheolydd, Bassaleg, that any trees were lost in the eight Orchards commenced in 1909, these being two each of Royal Jersey and White Jersey, the remaining forty-six trees having done well.

The Perry orchard for the planting season now being dealt with, was commenced on Lord Llangattock's Home Farm, where it is hoped that a typical perry orchard, in the truest acceptance of the term, will be established.

The 1909-10 planting has been continued, as far as the cider orchards are concerned, in the orchards already indicated ; but in addition to the completion of Lord Llangattock's perry orchard, two have been completely planted, one for Colonel W. E. C. Curre, at Pandy Mill, Itton, and one for Mrs. Gordon Canning, at Llanddewi Court, Abergavenny (Mr. R. Johnson).

It must be noted that the presentation of these finely grown

cider apple and perry pear trees to the county by the Board of Agriculture and Fisheries, the Bath and West of England Society, and the National Fruit and Cider Institute, are thoroughly appreciated both by the landlord and tenant alike; no better proof of this fact can be given than the numerous applications that are made for the starting of orchards throughout the whole county. It is also satisfactory to find how ready and willing every landlord has been, when approached, to provide excellent protection for the trees and in some instances also to plant the trees for their tenants.

The great object lesson of the Monmouthshire Committee for Agricultural Education in planting these cider orchards is that each shall contain the best representative varieties of each cider county, while at the same time they shall be kinds that will blend together for the production of cider of the highest character; and it is hoped that the three perry orchards, from the way in which they have been planted, will produce, as years roll on, a considerable quantity of from five to ten distinct types of perry, which should in favourable years be vintages suitable for bottling, and which will be not only more than a credit to the county but also hold their own with the much faked wines from abroad.

Devon.—The following report has been supplied by Mr. C. Berry, County Instructor in Horticulture:—Killerton. Owner, Sir Thomas Dyke-Acland. With a view to ascertaining the effect of various methods of pruning on the different varieties, some trees of each were hard pruned (about three quarters of the last year's growth being removed); some medium pruned (about one-half removed); and some pruned only very lightly or not at all.

(*a*) *Black Foxwhelp* (not *Rouge de Treves* as stated on page 65 N.F. & C.I. Report, 1908). (Eight trees).

The trees not pruned, that is, with the nursery growth uncut, have too heavy heads, and weak lower wood, with wood-buds dormant. Those from which one quarter only of the branch growths was cut off have better heads. I have not formed an opinion, and cannot at present, as to removing *threequarters* of 1908's growth, not of *one-half*. *Early.*

(*b*) *Improved Pound.* (Eight Trees). Irregular heads. Late. Trees not pruned have irregular growths. Hard pruning (three-quarters removed) seems to show, at present, the best result. I think that the threequarters left trees of Improved Pound do not show the advantage of leaving this sort long at planting time. A little Canker in two, which I will cut out and paint with Stockholm tar.

(*c*) *Medaille d'Or* (Eight trees). Very late, not moving (April 25th). Good heads. Thriving: Short, medium, long, or no pruning, does

not seem to hinder this variety here. I should like to wait a year longer before saying more about the pruning of Medaille d'Or.

About six years ago I was consulted about planting new orchards on Killerton Estate, at Hele, about three miles from Killerton. Kingston Black and Medaille d'Or were planted, in the same field, an iron fence dividing the two orchards. Medaille d'Or is healthier, stronger, and much more fruitful than Kingston Black. A farmer, a little way off from these orchards, has headed many of his trees with Medaille d'Or, and is highly pleased with the result—a striking testimony to the value of this variety grown in good soil —clay soil. The holes prior to planting were full of water, but not when planted. The holes were nearly a yard deep and two across.

(*d*) *Doux Amere* (Eight trees). The *hard-pruned* of this variety are too full of fruit-bud formation, in one case; but not in another. Those which had only a quarter of 1908 grown wood removed appear to be equally good, regular grown trees.

(*e*) *Yarlington Mill* (Eight trees). Hard pruning resulted in a stunted growth. Unpruned trees are good, full of plump buds. This variety grows strong, and looks very healthy.

(*f*) *Cap of Liberty* (Eight trees). This variety is second early, following Black Foxwhelp. Those not shortened at planting are too long, and weak, with fruit buds at extremities. The base wood buds are dormant. Hard pruned trees have done well. Perhaps middle-medium pruned trees will do best; but both hard and medium pruning have secured good heads.

Sir Thomas Acland is cultivating this orchard. I hope to report upon the better growth, if any, later on.

Kingsnympton. Owner, C. Tanner, Esq.

Soil a permanent pasture. The trees are not looking so well as at other centres. There is more frost, and the district is later. The strong winds and much rain had broken the cords, but the trees are now secured to the stakes. One tree is dead, one is badly cankered, and a third is almost dead. These three could not be planted before I left, because of heavy and continuous rains. The holes were full of water. The tenant planted these three trees when the water had subsided (the water does not keep about long in the meadow, but the rain was fairly constant and heavy). The other two trees are sickly, one is badly cankered. These will need replacing in the autumn. I offer no opinion; one died, one is almost dead, and the other may follow. The ground has not been properly fenced. The owner's attention has been called to this. Forty-nine trees, as follows :—

Five Chisel Jersey, eight Skyrmes Kernel, ten Broad Leaf Norman, eight Cherry Pearmain, eight Sweet Coppin, ten Knotted Kernel. I should like to report later—in the Autumn, about results of *pruning* and *not pruning*. We cannot know much at present, as to which methods will be best.

Oaklands Orchard, Okehampton. *Broad Leaf Norman* (5). Hard pruning has produced good results so far.

Knotted Kernel (5). Slight pruning has done best.

Cummy Norman (5), *Red Streak* (5), *Cowarne Red* (5), *and Cherry Norman* (5), on the whole have done best when moderately pruned. Two stakes were used, and wheat straw was used to bind the trees to the stakes. Not a tree has become loose, and these bands will last probably two years from planting time. This way of tying has proved the best. Not a tree is injured in the bark. About two-thirds are grass, with 6ft. diameter over each tree hoed; and one-third is under cultivation, to see what, if any, difference in growth, etc. A little Canker in two trees, others good.

Ashprington, Lower Washbourne, near Totnes. Owner, George Symons, Esq., executor of late brother.

Three sharp varieties: Foxwhelp (8), Hardwicke (8), Skyrme's Kernel (8); Five sweet: Broad Leaf Jersey (8), Bealy Down Pippin (8), Cremiere (8), Eggleston Styre (8), Ecarlatine (8); and Four bitter-sweet: Chisel Jersey (8), Harry Masters (8), Strawberry Norman (8), White Jersey (8).

The tenant thought that "the trees would die." That was his opinion while they were being planted, for "that was what happened to trees planted along that valley. The place was not suitable." They had never prepared the ground with such cost of labour as on this occasion. The ground is exposed to fierce sun-heat.

Many trees broke away from their cords during the strong winds of last winter. Some trees were allowed to continue to blow to and fro upon the wire guards, the tenant not re-tying them to the stakes. This has caused injury to some trees. And the owner did not order wire of the width requested, but said "*that* was the usual width that we use." Therefore a slight blowing put the trees on to the edge of wires. The other orchards have the wider wire guards. These trees will be pruned, and next year I will specially report upon the work.

Lower House, Branscombe, near Seaton, East Devon. Trees planted March 11th, 12th, 1910. Owner, J. Ford, Esq.

The rain was so constant during the time when the trees should have been planted that planting was done late. When we planted the trees the soil was not in what is (or was) called a good condition.

The trees were not puddled in, but the soil was very wet. We make this note for future reference, and will further report upon the apparent result of bad planting.

Somerset.—The report of Mr. John Ettle, County Instructor in Horticulture, is as follows:—As mentioned in the 1908-9 Report, land was provided for the three orchards at (1) Barton St. David, on the Kingweston Estate, tenanted by Mr. W. Masters; (2) on the Warwick Estate, Clutton, tenant, Mr. H. Gibbons; and (3) at Shepton Mallet, tenants, Messrs. Tilley Bros. At all three centres, with an exception mentioned below, the trees have grown very satisfactory.

At Barton we were able to obtain a small paddock of about three acres. Soil, heavy loam, approaching clay. The field is by the side of a main road, so that passers by can note (1) the excellent way in which Mr. Masters marked off the stations, and (2) the progressive growth of the trees. The trees were very well planted and fenced, Mr. Neville Grenville very kindly assisting Mr. Masters by cutting barrel-bands and wire netting to suitable sizes.

At Clutton, for reasons which could not be avoided, the planting could not be done till the late spring. Still, by Mr. Gibbons assisting the trees by watering during the dry weather in May, they have all done well. Most of the stations were marked out, and the trees planted and fenced by the woodmen on the estate under my occasional supervision. The first year's pruning was also done by them. This year's pruning was done by Mr. Gibbons's two young sons, who, after they had seen me do a few trees, proved themselves to be adept pupils. The soil here is very good loam. A part of the field had to be drained, which also was done by the estate agent, Mr. Paton.

In Messrs. Tilley's orchard a great deal of trouble was caused, and a lot of labour had to be expended in making holes for planting, owing to the stony nature of the subsoil. It reflects great credit on the tenants that, through their hearts being in their work, they worked so well. The trees were growing very satisfactorily until early in this year, when someone, evidently through spite, cut off the heads completely of about thirty of them, and hacked the stems of several others. We have sent the necessary trees to replace those spoilt, but the orchard has to a certain extent been spoilt for experimental purposes as originally intended.

In each of the orchards every alternate tree was cut back in the spring of 1909, and the others were pruned this year, to prove eventually which is the best system (if either)—pruning back the same season as planting, or waiting for another year.

Worcestershire.—The following reports have been collected by Mr. A. Weston Priestley, Director of Education :—

Moor.—Mr. Oldham writes as follows :—With reference to the trees of apples and pears planted last season I have great pleasure in reporting that all except three are living, and that they have been the admiration of everyone in the district on account of the excellent way in which they had been trained in the Nursery ; they are most certainly the tallest and most upright lot of stocks it has ever been my pleasure to plant. They are all very clean in the bark, and the knots have all healed over from pruning.

Greenfields, Upton-on-Severn.—Mr. W. S. Lane reports :—I was able to select and fence off a piece of old turf, about 1.83 acres, so the trees form an orchard by themselves ; they are staked and protected with wire from sheep and rabbits, while the lower parts are also washed with soot and milk. No cattle or horses are admitted.

The trees consisted of ten White Jersey, ten Kingston Black, five Ecarlatine, five Fair Maid of Devon, ten Court Royal, ten Harry Masters. They reached me in splendid condition, were well grown, well rooted, and with clean healthy bark.

The soil is medium loam, close on marl. The orchard is sheltered from the N.E. by high bank and hedge, slopes towards the S.W., and is naturally well drained.

All the trees grew, though one was very late breaking into bud ; they were mulched with dung after planting, and the top soil has been turned over this winter.

I do not propose to prune until next winter.

Newnham Court, Tenbury.—Mr. E. Vincent V. Wheeler writes : The trees from the National Fruit and Cider Institute, planted in 1909 are all alive and have made a start, but not much growth. The land on which they are planted is not very good, and not to be compared to the Long Ashton land. They are planted on a rather exposed bank, facing north, each of the varieties being in a row by itself, running up and down the slope. Towards the top of the hill the soil is shallow, and the marl comes very near the surface. The trees were all dug round and manured when planted, but this year I am letting them grass over again, as I do not think it will pay to dig round cider fruit trees. If anything, the Knotted Kernel have made the best growth, but there is little difference. The sorts planted were Medaille d'Or, Broadleaf Norman, Knotted Kernel, Strawberry Norman. This year the Cherry Norman trees from the Institute have been planted in the same field.

Powick, near Worcester. Mr. G. Braine Hartnell reports that

the trees sent here by the National Fruit and Cider Institute have been planted and are all doing well.

Madresfield.—Mr. A. Allsebrook reports as follows :—The fifty perry pear and cider apple trees, kindly sent by the National Fruit and Cider Institute, were planted out in the winter of 1908-9, and as they were not enough to make an orchard, 450 other fruit trees, consisting of plums, cider apples and perry pears were planted with them. The trees are planted in rows, and are so arranged that the apples and pears, which it is intended shall form the permanent crop, shall be 40 feet apart when the plums have been taken out. The trees are planted on grass, but each tree is dug round for a radius of about 3 feet. They have now been mulched and they are all looking very well.

The orchard is situated within the gate of the back roadway to Madresfield Court, adjoining the road on the left-hand going towards and quite near the house of Mr. Crump, the head gardener, under whose care the fruit trees are.

Mr. Crump or I would be very glad to show the orchard to anyone who would like to inspect it on behalf of the Worcester County Council or of the Institute.

Mr. Crump adds that the trees have all done splendidly, with no losses, all making excellent first year's growth. They have been properly pruned and grease-banded.

Woollas Hill, Pershore.—Mr. J. William Dee reports as follows :—The apple and pear trees had through the Worcester County Council from the National Cider Institute in the autumn of 1908, were capital stocks and at present look very promising. Every tree grew, and did well. They have not yet been pruned, as I think it best to let them make plenty of root-growth before pruning. I have been planting more cider fruit this time, but could not get anything like as good stocks from the Nurserymen.

Board of Agriculture and Bath and West Society's Orchards.

Harper-Adams College, Newport, Shropshire.—Principal P. Hedworth Foulkes, B.Sc., reports that all the trees with one exception have done well, and have been pruned into shape, and now appear to be thriving.

Woolston, Somerset.—Mr. C. Osborn writes as follows :—The trees were carefully planted and fenced at once. All are growing and looking very healthy and promising, being remarkably free from blight or canker. We formerly planted larger trees, and head-

grafted many of them afterwards ; but with the exception of a few choice and delicate sorts, such as Kingston Black, which do not make good stocks, we now prefer planting a younger tree, worked from the ground, as giving the best results, and, as we believe, a longer life as well as a healthier one. We hope the Institute will continue to increase its nursery work, for it has been difficult up to the present time for growers to get the best and choicest cider apple trees.

Aspall Hall, Suffolk.—Mr. J. B. Chevallier has sent the following report :—1909. About 430 bush apple trees and 130 apple standards were planted in addition to the 50 trees contributed by the Board of Agriculture.

All the standards came from the Cider Institute, and on arrival were found to be much damaged by the journey. The wounds were dressed with a mixture of sulphate of copper, clay, and cow-dung. The roots were pruned, and the trees laid in mould until the end of January, when they were planted, the ground being in very good order. The trees were not top-pruned.

The orchard was thoroughly winter-sprayed, the washes used being Bentley's Caustic Soda, Coopers' V.I, and C.U. Wash.

There was a bad attack of Caterpillar in the spring ; Swift's Arsenate of Lead Paste proved an effective antidote.

The trees were also troubled with Aphis, and were sprayed, part with Herrod's Summer Wash, part with Quassia Extract ; but owing to the continual rain, neither were very successful. Nevertheless the trees made good growth during the summer.

A demonstration of Summer Pruning, August 9th to 17th, was attended by thirty-nine persons.

1910. The trees were hard pruned in the winter and sprayed with lime, salt and sulphur.

Four plots of the orchard are being treated with chemical manures, by the Potash Syndicate, to illustrate the effect of complete manuring ; of manuring without potash ; of manuring without phosphates ; and of manuring without nitrogen.

The rest is being treated with farmyard and stable manure.

A black currant bush is set between each tree in the same line, and the spaces between the lines are horse cultivated, and planted with potatoes, onions, or cabbages.

There were thirty-two visitors to the orchard while winter spraying was going on.

The trees are showing good promise of bloom, but the season is backward.

It is intended to use Herrod's Apple Sucker and Aphis Wash and Hartjen's H. Emulsion during the summer.

Much Marcle, Hereford.—Mr. L. E. Fowles writes as follows :—There were planted four trees each of Butleigh No. 14, Stubbard, Eggleton Styre, Foxwhelp, Cherry Pearmain, Cap of Liberty, Knotted Kernel, Cummy Norman, Sweet Alford, Skyrme's Kernel, Bealy Down Pippin, and five each of Medaille d'Or, Sweet Coppin, Red Streak and Dabinett.

All the varieties appear to have grown equally well with the exception of the Dabinett, of which two have died. They are planted on arable land, strong loam on the Old Red Sandstone, sheltered north and east, and open to the south and west, and are evidently flourishing under these conditions. The only protection they have at present is wire netting at the foot to prevent rabbits spoiling. They have not yet suffered from not being staked; but this operation is being done now, although having been planted well they have not suffered from the effects of the wind. The trees are planted ten yards apart and were planted early in December, 1908, with the exception of the four last named varieties (five of each—twenty trees), which were planted early in February, 1909.

Upton, Loders, Dorset.—Mr. E. C. Parslow, County Instructor in Horticulture, sends the following report :—The trees were planted rather late in the season (March, 1909), owing to heavy snowstorms, while the ground was in a not too favourable condition. Under the circumstances the trees may be considered to have made very satisfactory progress, and have aroused a great deal of interest in the neighbourhood.

The trees were pruned after planting (March 19th), to an average of two-thirds back, and have been again pruned this year back to within an average of four inches of the previous year.

Eggleton Styre appears to be rather a weak grower and a poor doer, and made very little growth. This variety has been pruned hard back. The following is about the average growth made : Eggleton Styre, about 3in. to 5in., Cremiere 12in., Foxwhelp 10in., Virgin Mary 14in., Broadleaf Norman 18in., Neverblight 18in., Court Royal 20in., Rouge de Treves 16in., Medaille d'Or 12in., Yarlington Mill 20in.

Previous to planting it was noted that the Foxwhelp stocks were rather faulty and inclined to canker at the base. This has developed, and steps have been taken to eradicate the disease. It is noted that healthy tissue is being formed, and it is intended to paint the wounds this season at intervals with H. Emulsion (1 part to 5 parts of water). The trees have been sprayed with a caustic soda wash.